

Environmental Monitoring Report

Project No. 44429-013
For the period June 2017 to May 2018
August 2018

India: Climate Adaptation in Vennar Subbasin in Cauvery Delta Project

(Main Report)

Prepared by the Water Resources Department, Public Works Department, Government of Tamil Nadu and the Asian Development Bank.

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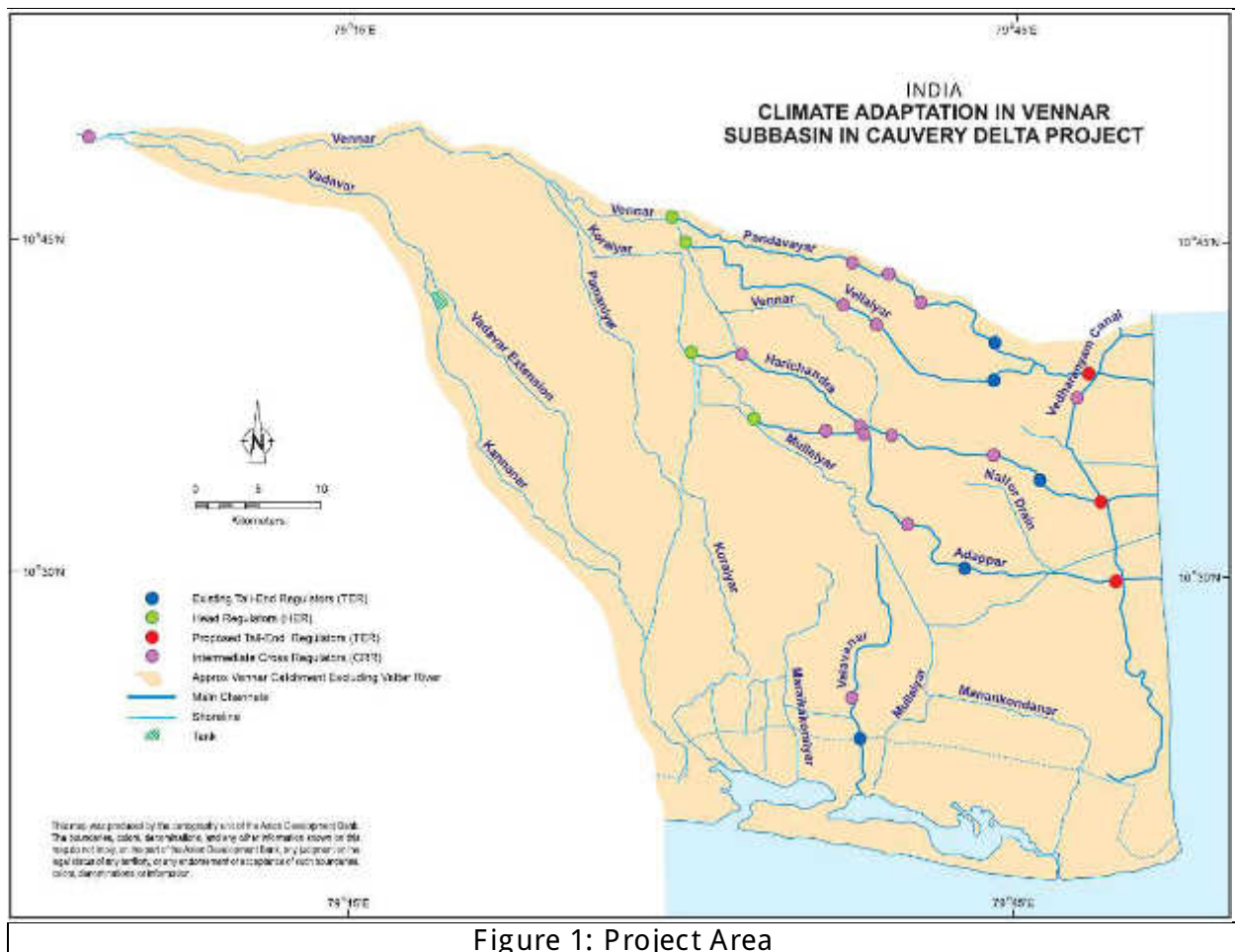
List of Abbreviations

ADB	: Asian Development Bank
AAQ	: Ambient Air Quality
BDL	: Below Detection Limit
BIS	: Bureau of Indian Standards
dB (A)	: A-weighted decibels
CAVSCDP	: Climate Adaptation in Vennar Sub-basin in Cauvery Delta Project
CRZ	: Coastal Regulation Zone
DO	: Dissolved Oxygen
DLP	: Defect Liability Period
EA	: Executing Agency
EMP	: Environmental Management Plan
IEE	: Initial Environmental Examination
IS	: Indian Standards
mg/l	: Milligrams Per Liter
MoEF&CC	: Ministry of Environment, Forest and Climate Change
MoU	: Memorandum of Understanding
NoC	: No Objection Certificate
NGO	: Non-Governmental Organisation
PIC	: Project Implementation Consultant
PIU	: Project Implementation Unit
PMU	: Project Management Unit
PPE	: Personal Protective Equipment
PWD	: Public Works Department
RP	: Resettlement Plan
R&R	: Resettlement and Rehabilitation
SEIAA	: State Environmental Impact Assessment Authority
SOG	: Standard Operating Guideline
TDS	: Total Dissolved Solids
WRD	: Water Resource Department

1 Introduction

1.1 About the project

1. The Cauvery Basin is the largest of 17 river basins in Tamil Nadu and is located in Karnataka, Kerala and Tamil Nadu. The sub-areas of the Cauvery Basin lies within each of the three riparian states and the enclave of Karraikal in the Union Territory of Puducherry. The project includes structural and non-structural measures to support improved flood and irrigation management to help communities in the Vennar sub-basin (Figure 1) of the Cauvery delta adapt to climate change. WRD of the Public Works Department (PWD), Government of Tamil Nadu, is the executing agency. The project includes re-sectioning of river/canals, de-silting of river bed, construction of new or rehabilitation old or reconstruction of head regulators, cross regulators, drainage outfall, irrigation outfalls and infalls on rivers. In addition, the program will support improvements to water resources management in the Cauvery delta by implementing improved monitoring and decision support system.



Source: WRD, PWD

Table 1: Details of the Project Rivers

Feature	Adappar	Harichandra	Vellaiyar	Pandavayar	Valavanar	Vedharanyam Canal
District	Thiruvarur, Nagapattinam	Thiruvarur, Nagapattinam	Thiruvarur, Nagapattinam	Thiruvarur, Nagapattinam	Thiruvarur, Nagapattinam	Nagapattinam
Purpose of River	Irrigation and Drainage	Irrigation and Drainage	Irrigation and Drainage	Irrigation and Drainage	Drainage	Drainage
Location of Head Regulator	10°36'47"N 79°33'9"E	10°39'45"N 79°30'28"E	10°28'51"N 79°44'50"E	10°45'46"N 79°29'34"E	10°31'42"N 79°38'41"E	10°44'38"N 79°30'15"E
Length of River (km)	44.5	43.6	47.9	38.2	19.3	39.6
Drainage area (ha)	11548	13822	12622	428	15,977	0
Ayacut irrigated (ha)	760	17535	10920	8504	1084	0
Cropping Pattern	Rice/gram	Rice/gram	Rice/gram	Rice/gram	Rice/gram	Rice/gram
Normal irrigation Discharge (m ³ /s)	1	17	26	15	NA	NA
Peak flood discharge (Q25) (m ³ /s)	70	129	127	65	38	
Number of Irrigation offtakes	13	56	36	51	0	0
Number of Drainage Infalls	35	16	18	13	44	23

Source: WRD, PWD

1.2 Project Description

2. Irrigation to the delta is supplied from the Cauvery River at the Grand Anicut, where the Cauvery River bifurcates into Cauvery and Vennar. The irrigation systems in the delta have evolved over centuries, whereby natural rivers were adapted to serve as irrigation canals and drains. The result is a complex network of natural and built canals and drains. Most of the regulatory structures in the Vennar system are more than 100 years old and some are fully dilapidated. Shoals formed in the center of the channels hinder the free flow of water, and some tail-end command areas no longer receive surface water. Existing embankments are damaged or weak. At the operational level, water distribution is not systematic and is based mainly on the judgment of WRD staff in response to requests from farmers. At the farm level, the application of irrigation water is inherently inefficient.

3. The core water resources problem facing the Vennar irrigation and drainage system is insufficient integration of water resources management. The principal causes of the problem are:

- i. A growing and unsustainable dependence on groundwater with salinity becoming a major concern;
- ii. Highly water-consumptive agricultural systems;
- iii. Vulnerability to fluvial and coastal floods, exacerbated by inadequate drainage capacity, the poor state of TERs and minimal coordination of regulation, which is likely to become more acute as the climate changes;
- iv. Vulnerability to droughts which may become more acute as the climate changes;
- v. Uncoordinated water resources development and management with supply-side measures dwarfing demand-side measures.

4. To manage the core water resources problem, the Government of Tamil Nadu has requested Asian Development Bank (ADB) financing to upgrade the Vennar system. The proposed project is consistent with ADB's country partnership strategy, 2013-2017 for India, which seeks to overcome water insecurity and help communities adapt to climate change, and to promote efficient and sustainable water management in agriculture. The proposed project is aligned with the aims of the Government of India's National Water Policy, Twelfth Five Year Plan, and National Water Mission. The project is also aligned with ADB's strategic and sector goals as articulated in

- i. ADB's Strategy 2020 and its midterm review;
- ii. The Water for all policy;
- iii. The Water Operational Plan, 2011-2020; and
- iv. The Operational Plan for Integrated Disaster Risk Management, 2014-2020.

1.2.1 Proposed Interventions

5. The proposed works of Project are defined as below:

- i. Re-sectioning of the river channel which includes cleaning the channel of vegetation, desilting/dredging and widening.
- ii. Re-grading of the river channel which includes excavation of the channel bed to remove sand bars and other impediments to restore the channel to its design section (also known as de-silting).
- iii. Standardization of banks which includes raising and strengthening of the embankments, decreasing bank side slopes, increasing top width, construction of road etc. to bring the embankment back to Bureau of Indian Standards (BIS) to withstand 25 year return floods taking climate change considerations into account.
- iv. Repairs of structures - head regulator, cross or intermediate regulators, TERs, irrigation sluices, drainage sluices, drainage infalls, irrigation syphons, drainage syphons, bed dams and grade walls. Repairs are the restoration of the components of the structures to function as designed.
- v. Reconstruction of existing and construction of new head regulators, cross or intermediate regulators, TERs, irrigation sluices, drainage sluices, drainage infalls, irrigation syphons and drainage syphons, bed dams, and grade walls. Reconstruction is the demolition and removal of all components of the existing structure and construction of new structure including foundations on the same site.
- vi. Fluming and River Training. Bank revetment/pitching and masonry walls depending upon severity of the problem of bank failure and availability of land.

1.3 Project's Physical Progress

S. No.	Project Packages	Details of work under Package	Commencement of Civil Works	Expected date of Completion	Physical Progress till date (in %)
1.	CW1-CAVSCD/TN/HRN	Infrastructure Improvements and Reconstruction Works on Harichandranathi from LS 121.142 Km to 160.200 Km & Law ford Straight Cut from LS 0 to 3.900 Km.	4 th November, 2016	3 rd November, 2019	35.0
2.	CW 2-CAVSCD/TN/ADP	Infrastructure Improvements and Reconstruction Works on Adappar River from LS	4 th November, 2016	3 rd November, 2019	35.0

S. No.	Project Packages	Details of work under Package	Commencement of Civil Works	Expected date of Completion	Physical Progress till date (in %)
		130.236 Km to 169.025 Km & Adappar Straight Cut from LS 0 to 2.40 Km.			
3.	CW 3-CAVSCD/T N/CLR	Infrastructure Improvements and Reconstruction Works on Vellaiyar River from LS 111.650 Km to 153.650 Km.	24 th February, 2016	23 rd February, 2019	40.0
4.	CW 4-CAVSCD/T N/PDR	Infrastructure Improvements and Reconstruction Works on Pandavaiyar River from LS 109.270 Km to 148.020 Km.	26 th February, 2016	25 th February, 2019	80.0
5.	CW 5-CAVSCD/T N/VNR	Infrastructure Improvements and Reconstruction Works on Valavanar Drain from LS 0 Km to 19.300 Km.	3 rd November, 2016	2 nd November, 2019	50.0
6.	CW 6-CAVSCD/T N/VRM	Infrastructure Improvements and Reconstruction Works on V. Canal and Uppanar	3 rd November, 2016	2 nd November, 2019	50.0
7.	CAVSCD/T N/PS	Design, Supply, Installation, Testing and Commissioning of Various pumping machinery including associated electrical, Mechanical and civil works	23 rd November, 2016	22 nd May, 2018	80.0

Source: PIU's

2 Project's Environmental Safeguards

2.1 Purpose of Environmental Monitoring Program

6. The purpose of Environmental Monitoring Program is to ensure the effective implementation of the recommended mitigation/ management measures (as indicated in the EMP, which is enclosed as a supplementary information in the Contract Agreement) and to comply with the conditions of the environmental legislations, rules and regulations of India. It will be essential to develop an environmental management mechanism and procedures in the form of Environmental Monitoring Program.

2.2 Objectives of carrying out Environmental Monitoring Program

7. The objectives of carrying out the Environmental Monitoring Program include the following:

- ¿ To provide a database against which short or long term environmental impacts of the projects can be determined;
- ¿ To provide an early indication, environmental control measures or practices should not fail to achieve the acceptable standards;
- ¿ To monitor the performance of the projects and the effectiveness of mitigation measures;
- ¿ To verify the environmental impacts predicted during the IEE studies;
- ¿ To determine compliance with regulatory requirements, standards and government policies;
- ¿ To take remedial action if unexpected problems or unacceptable impacts arise

2.3 Approach and Methodology

8. As an Environmental Consultant (PIC), will be conducting on-site supervision, e.g. whether the construction is carried out as per the clauses of the environmental protection (as mentioned in the Contract Document) and EMP; whether the environmental protection requirement is satisfied during the construction process; whether it is carried out as per the design requirements of the environmental protection. In addition, the supervision works shall include

- ¿ Monitoring the potential construction related impact
 - o Erosion hazards
 - o Noise and vibrations impacts
 - o Impacts on air and water quality
 - o Impacts on flora and fauna
 - o Impacts on physical resources
 - o Impacts due to waste generation
 - o Impacts on occupational health and safety
 - o Impacts on socio-economic activities
- ¿ Environmental Quality monitoring for Water (Groundwater and Surface Water), Air and Noise environs
- ¿ Preparation and submission of Quarterly/ Annual Environmental Monitoring Reports

2.4 EMP implementation and Monitoring Arrangements for CAVSCDP

9. The following agencies will be responsible for EMP implementation:

- ∴ The Water Resources Department (WRD) of the Public Works Department (PWD), Government of Tamil Nadu is the Executing Agency (EA), responsible for overall management, coordination, and execution of all activities funded under the loan.
- ∴ Project Management Unit (PMU) is set up in Tiruchirappalli (Trichy) to coordinate the overall execution.
- ∴ Project Implementation Consultants (PIC) in Tiruchirappalli (Trichy) provides assistance to PMU in execution as well as in procurement and ensures technical quality of design and construction.
- ∴ Project Implementation Unit's (PIUs) are established in (i) Thiruvarur, (ii) Nagapattinam, (iii) Thiruthuraipoondi, (iv) Vennar Basin, Thanjavur and (v) Cauvery Basin, Thanjavur. The PIU's will look into the progress and coordination of day to day construction works.
- ∴ The Contractor will be responsible for execution of all construction works. The Contractor will work under the guidance of the PIUs. The EMP mitigation measures relevant to construction phase will also be implemented by the Contractor.
- ∴ For the Resettlement Sites, EMP has been circulated to the PWD (Buildings) to include it in the ongoing and upcoming construction works and the EMP implementation will be monitored by the PWD (Buildings) and it will be accordingly reported to the PMU (WRD).

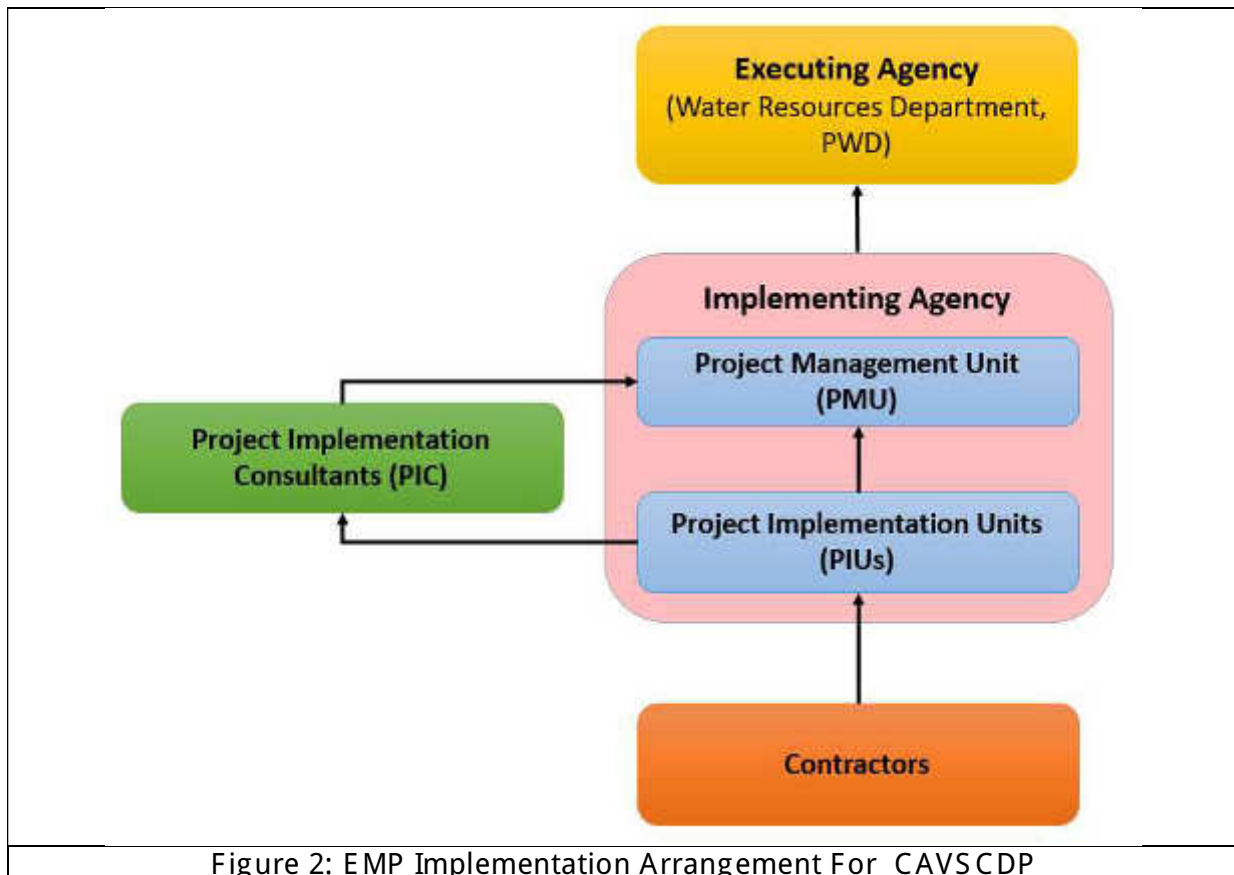


Figure 2: EMP Implementation Arrangement For CAVSCDP

3 Status of Environmental Safeguard Compliance (Package Wise)

3.1 Package No. CW 1 - CAVSCD/TN/HRN (Infrastructure Improvements and Reconstruction Works on Harichandranadhi from LS 121.260Km to 160.200Km & Law ford Straight Cut from LS 0 to 3.900Km)

3.1.1 Compliance with Statutory Environmental Requirements

Sl.no	Clearance/ Approval Required	Compliance Status
1.	The EIA notification, 2006 (and its subsequent amendments)	Complied. Correspondence from Ministry of Environment, Forest and Climate Change (MoEF&CC), indicating the CAVSCD Project does not require Environmental Clearance is enclosed in the Annexure-1
2.	Coastal Regulation Zone (CRZ), 2011 (and subsequent amendments)	Complied, A section of the project area (at the tail end) falls under the CRZ and accordingly CRZ clearance has been obtained (Refer Annexure-2)
3.	Forest (Conservation) Act, 1980 and amendments and rules there in- (Forest Clearance for felling of forest trees)	Complied. Tree cutting clearance is obtained from the forest department.
4.	The Motor Vehicle Act, 1988 and subsequent amendments	Complied. All the construction vehicles are having appropriate permissions and permits (refer Annexure - HR 1)
5.	Sourcing of construction materials (quarry and borrow materials)	<p>Complied for Borrow earth</p> <p>(i) As per the records dt 06/07/2017, a tank in Karapidigai (village) located in Kilvelur (Taluk), Nagapattinam District has been identified for acquiring borrow earth.</p> <p>Complied for Sand Mining</p> <p>(i) Environmental clearance from SEIAA vide letter dated 09.05.2017 Lr.no 5956, 5957, 5958/EC 1 (a)/3929/2017, the soil material is sourced from the Kollidam River, Nagapattinam District at</p> <ul style="list-style-type: none"> ζ Siddamalli Village (Mayiladuthurai Taluk) ζ Vadarangam Village (Sirkazhi Taluk) ζ Kadakkam Village (Mayiladuthurai Taluk) <p>(ii) Environmental clearance from SEIAA vide letter dated 21.06.2017 Lr. No SEIAA TN/F.No. 3223,3971/EC/1(a)/1817(A)/2014-1, the soil material is sourced from the Kollidam River, Thanjavur District at</p> <ul style="list-style-type: none"> ζ Nadupadugai Village (Papanasam Taluk) ζ Koviladi Village (Boothalur Taluk) <p>However, as per the instruction from Government of Tamil Nadu, sand is procured through online. A copy of the online receipt is given in the Annexure - HR 2.</p>

Sl.no	Clearance/Approval Required	Compliance Status
6.	Water (Prevention and control of pollution) Act, 1974 and Air (prevention and control of pollution) Act, 1981	Partially Complied. The Contractor is outsourcing the ready-mix concrete from a Private Batching Plant. However, the general conditions stipulated in the Consent to Operate (CTO) is not fully adopted. The Consent for the Batching Plant from the Tamil Nadu pollution Control Board is enclosed in the Annexure - HR 3.
7.	Noise Pollution (Regulation & Control) Rules, 2000	Complied. Based on the results of the Environmental Monitoring conducted for Noise Quality, it is observed that the values are less than the stipulated standard.
8.	Tamil Nadu Contract Labour (Regulation and Abolition) Rules and subsequent Amendments	Complied. As per the Act, labour license is obtained (refer Annexure - HR 4)
9.	Workmen's Compensation Act, 1923 and Subsequent amendments	Complied. As per the Act, labour insurance is obtained (refer Annexure - HR 5)
10.	The Wildlife Protection Act, 1972, amended in 2003 and 2006	Not applicable, as there are no ecological sensitive areas located within or in the surroundings of the project site

3.1.2 Compliance status with Loan Covenant

Sl. No.	Loan Agreement Reference	Environmental Compliance Requirements	Compliance Status
1.	Schedule 5, item 4 of Loan Agreement Safeguards and Social Environment	The Borrower shall ensure, or cause the EA to ensure, that the preparation, design, construction, implementation, operation and decommissioning of the Project facilities comply with (i) all applicable laws and regulations of the Borrower and the State relating to environment, health, and safety; (ii) the Environmental Safeguards; and (iii) all measures and requirements set forth in the IEE and the EMP, and any corrective or preventative actions set forth in a Safeguards Monitoring Report.	Complied
2.	Schedule 5, item 7 of Loan Agreement Human and Financial Resources to Implement Safeguards Requirements	The Borrower shall make available, or cause the EA to make available, all necessary budgetary and human resources to fully implement the EMP, the RP and the IPP if and as required. The EA shall designate at least one expert each to supervise implementation of the EMP, and the RP.	Complied Environmental Specialist and R&R Specialist has been appointed by the EA to supervise the implementation of the EMP and RP.
3.	Schedule 5, item 8 of Loan Agreement Safeguards - Related	The Borrower shall, or cause the EA to ensure, that all bidding documents and contracts for Works contain provisions that require contractors to:	

Sl. No.	Loan Agreement Reference	Environmental Compliance Requirements	Compliance Status
	Provisions in Bidding Documents and Works Contracts	<p>a) Comply with the measures and requirements relevant to the contractor set forth in the IEE, the EMP, and the RP and the IPP as applicable (to the extent they concern impacts on affected people during construction), and any corrective or preventative actions set out in a Safeguards Monitoring Report;</p> <p>b) Make available a budget for all such environmental and social measures;</p> <p>c) Provide the WRD with a written notice of any unanticipated environmental, resettlement or indigenous peoples risks if any, or impacts that arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP, and the RP or the IPP if any;</p> <p>d) Adequately details the condition of roads, agricultural land and other infrastructure prior to starting to transport materials and construction; and</p> <p>e) Fully reinstate pathways, other local infrastructure, and agricultural land to at least their pre-Project condition upon the completion of construction.</p>	<p>Complied, Environmental management plan along with the monitoring plan is enclosed in the bid document as a supplementary Information</p> <p>Complied, exclusive EMP budget is not available. However, the cost for implementing the EMP is included in the contractor cost. For social, separate RP budget is available</p> <p>Not envisaged</p> <p>Complied, the existing landuse is studied and accordingly the construction activities are planned</p> <p>It will be addressed upon completion of construction</p>
4.	Schedule 5, item 9 of Loan Agreement Safeguards Monitoring and Reporting	<p>The Borrower shall do, or cause the EA to do, the following:</p> <p>a) Submit semi-annually Safeguards Monitoring Reports (one each for the resettlement and environment matters) to ADB and disclose relevant information from such reports to affected persons promptly upon submission;</p> <p>b) If any unanticipated environmental and/or social risks and impacts arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP, and (9d)the RP or the IPP as applicable, promptly inform ADB of the occurrence</p>	<p>Partially Complied, Semiannual report on the Resettlement is submitted. However, due to the unavailability of the Environmental expert, semi-annual report of the environment is not submitted.</p> <p>Complied, as of now there is no unanticipated environmental and/or social risks and impacts raised. If such impacts arises in future, it shall be informed to the ADB.</p>

Sl. No.	Loan Agreement Reference	Environmental Compliance Requirements	Compliance Status
		<p>of such risks or impacts, with detailed description of the event and proposed corrective action plan;</p> <p>c) No later than award of Works contract/commencement of land acquisition and resettlement activities under the Project engage a qualified and experienced external expert or NGO under a selection process and terms of reference acceptable to ADB, to verify information produced through Project monitoring process, and facilitate the carrying out of any verification activities by such external expert/NGO for the Project; and</p> <p>d) Report any breach of compliance with the measures and requirements set forth in the EMP, and the RP or the IPP if any, promptly after becoming aware of the breach.</p>	<p>Complied, qualified NGO's are engaged to verify information produced through Project monitoring process</p> <p>Complied. Such situation does not arise</p>
5.	Schedule 5, item 10 of Loan Agreement Prohibited List of Investments	The Borrower shall ensure, or cause the EA to ensure, that no proceeds of the loan under the Project are used to finance any activity included in the list of prohibited investment activities provided in Appendix 5 of the SPS.	Complied, provided ADB loan is spent for the CAVSCD Project
6.	Schedule 5, item 11 of Loan Agreement Labor Standards	The Borrower, State, and WRD shall ensure that Works contracts under the Project follow all applicable labor laws of the Borrower and the State and that these further include provisions to the effect that contractors; (i) carry out HIV/AIDS awareness programs for labor and disseminate information at worksites on risks of sexually transmitted diseases and HIV/AIDS as part of health and safety measures for those employed during construction; and (ii) follow and implement all statutory provisions on labor (including not employing or using children as labor, equal pay for equal work), health, safety, welfare, sanitation, and working conditions. Such contracts shall also include clauses for termination in case of any breach of the stated provisions by the contractors.	<p>Complied, appropriate Clauses (section 31, 32 and 33) is included under the general condition of the Contract for Labors.</p> <p>HIV/AIDS awareness programs are conducted for labors.</p> <p>Child labors are not engaged in the construction activities</p> <p>Appropriate clause for termination is included in the contract.</p>

3.1.3 Compliance with Project Environmental Management Plan (EMP)

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
Pre - Construction Stage				
Approvals and No Objection Certificate	Obtain CRZ Clearance Obtain Approval from Forest Department and Revenue Department for Felling of Trees	Complied	Satisfactory	General Conditions as stipulated in the Clearance should be adopted
Selection of Construction Camp for site office and storage of material, parking of vehicles and Workers Camp for labour to stay during non-working hours.	Since establishment of construction camp and labour camp are the decision of Contractor. Selection of Construction camp and workers camp away from the habitation area, Contractor to provide safe drinking water as per IS 10500 standards for drinking water. Provide sanitation for male and female workers. Collection and disposal of solid waste of the worker's camp	Partially Complied	<ul style="list-style-type: none"> ¿ Construction camp is located away from local settlements. Private land has been hired by the Contractor for storage of Construction Materials (MoU/ Agreement between the land owner and the Contractor is given in the Annexure - HR 6) ¿ Since local labours are engaged the necessity for labour camp does not arise. ¿ Labours are provided with drinking water facility. ¿ Sanitation facilities lacks at site (female workers are not engaged). ¿ Solid waste management at site needs improvement 	Continuous Monitoring is required
Identification of borrow pits and quarry area	Selection of Borrow pits for earth should be away from residential area, sensitive location, and local roads. Before selection of borrow area, the contractor will take written consent from the environmental officer of PMU. Selection of sand, stone and	Complied	Satisfactory	Continuous Monitoring is required

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
	other quarry material will be only government approved sites only			
Intervention with Utility	The contractor will identify water supply pipes, electrical poles, cables and access roads and bridges and prepare plans for shifting or reconstruction	Complied	Shifting of utilities are carried out by the concern line departments.	Continuous Monitoring is required
Construction Stage				
Ambient Air Quality and Noise				
De-silting and resection of river	Dust suppression by sprinkling of water. Provide dust curtain or geotextile membrane to cover soil.	Partially Complied	Water sprinkling should be performed more frequently and construction materials including soil should be covered.	Continuous Monitoring is required
Transportation of construction material, borrow earth and river silts	Provide covered transportation of material and earth, Avoid haulage rout in residential area and sensitive locations	Not Complied	Vehicle carrying transportation materials are not covered	Continuous Monitoring is required
Operation of construction equipment's and vehicles	Maintenance of vehicles and equipment as per manufacturers guidelines and monitor emissions of the vehicles and equipment	Partially Complied	Routine maintenance of the construction vehicles should be carried out and appropriate register should be maintained	Continuous Monitoring is required
Quarrying and borrowing of earth for construction of embankment and road	<p>Quarrying of sand, stone and aggregates will only be from the government approved quarries.</p> <p>Operation and Rehabilitation of borrow area as per the Madras Detailed Standard Specification</p> <p>Arrangement for locating the source of supply of material for embankment and sub-grade as well as compliance to environmental requirements, as applicable shall be the sole responsibility of the contractor. WRD</p>	Partially Complied	<p>It is informed by the Contractor that the Quarrying materials are being procured from authorized vendors. However substantial evidences (NoC from PCB, Mine departments etc.,) are not submitted</p> <p>The borrow areas identified by the Contractor is verified by the PMU. It is also informed to the Contractor</p>	Continuous Monitoring is required

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
	<p>shall be required to inspect every borrow area location prior to approval.</p> <p>The Contractor shall not borrow earth from the selected borrow area until a formal agreement is signed between land owner and Contractor and a copy of this agreement is submitted to the concerned officer of WRD/Supervision Consultant</p> <p>Planning of haul roads for accessing borrow materials shall be undertaken during this stage. The haul roads shall be routed to avoid agricultural areas. In case agricultural land is disturbed, the Contractor shall rehabilitate as approved by the WRD/ Supervision Consultant and pay compensation for loss of cultivation to the users as per terms and conditions of the resettlement plan.</p> <p>All borrow areas whether in private, community or govt. land shall be restored either to the original condition or as per the approved by WRD/ Supervision Consultant</p>		<p>that the excavated soil if found suitable shall be utilized for construction works. Accordingly the excavated soil material is being used.</p> <p>Appropriate agreement/ MoU between the private land owners and the Contractor is yet to be furnished to the PMU/PIC</p> <p>Existing road network is being used for transportation of the borrow material to the site</p> <p>The work is ongoing and during the completion all the borrow area that are used for this construction works shall be restored.</p>	
Soil Environment				
<p>Standardisation of embankment and desilting of river and construction of road on one side embankment. Operation of borrow pits and transportation of material</p>	<p>After cutting and filling embankment will be immediately stabilized</p> <p>Avoid de-silting within the flow of water.</p> <p>Encourage utilisation of river silt in gardening and other agricultural</p>	Complied	<p>The excavated river silt is utilized for embankment strengthening.</p>	<p>Continuous Monitoring is required</p>

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
	purpose identified in consultation with farmers.			
Disposal of construction debris	Prohibition of throwing of construction debris in any sites other than the designated disposal sites identified at the detailed design stage The metallic waste will be recycled through vendors.	Partially Complied	Designated site for disposal of the construction debris is not identified.	Continuous Monitoring is required
Water Resource and Quality				
Resection and desilting of river Construction of tail-end regulators (TERs), Irrigation head sluices, drainage infalls, syphons, Bed dam, Grade dam, Chance spillage of oil, grease from heavy machineries, construction vehicles and equipment's	<p>Since the most of the construction work will take place in the lean season so mitigation measure of avoidance of desilting within the flow of water will minimise soil erosion and increase in turbidity in the downstream.</p> <p>Provide impermeable platform for storage and handling of oil and grease.</p>	Complied	<p>Construction works shall be performed during the lean season only.</p> <p>However, it is evident from the site that impermeable platform for storage and handling of oil and grease is not provided</p>	
Biological Environment				
Clearance and grubbing of site for construction of embankment	<p>The removal of the cut trees by the forest department will be taken away by the forest department and it will be stored and later sold by the forest department according to their rules.</p> <p>The trees which are not planted by the forest department will be cut and removed by the contractor on permission of district revenue officer.</p> <p>Compensatory Plantation of 10:1 ratio meaning plantation of 10 trees in lieu of felling of 1 tree</p> <p>Forest Department will cut those trees which are planted by the forest department and its compensatory</p>	Complied	Trees falling in-between the River RoW are identified and compensation for the removal of trees as suggested by the Forest Department is paid. Presently, removal of trees/ cutting of Trees is under progress	Continuous Monitoring is required.

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
	<p>plantation will be done by the forest department.</p> <p>Other trees which are not planted by the forest department, WRD will do the compensatory plantation</p>			
Occupation Health and Safety				
Occupational Health and Safety of labours at construction site and Labour camps	<p>Provide personal protective equipment to the labours.</p> <p>Ensure the labours are trained to work on the specific project.</p> <p>For untrained labour - training should be provided before permission to work on the site.</p> <p>The contractor shall provide, if required, erect and maintain necessary (temporary) living accommodation and ancillary facilities during the progress of work for labour to standards and scales approved by the PIU.</p> <p>Contractor shall follow all relevant provisions of the Factories Act, 1948 and the Building & other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction & maintenance of labor camp.</p> <p>Construction camps shall not be proposed within 1000m or sufficiently away from nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community.</p> <p>The location, layout and basic facility provision of each labour camp shall be submitted to Engineer prior to their</p>	Not Complied	<p>Labours are not provided with appropriate PPE š. It is evident from the consultations had with the labours that they lack training.</p> <p>Temporary labour shed lacks basic amenities. It is suggested to adopt the factory and labour act provisions for the labours.</p> <p>Construction camps are located away from the settlement sites</p> <p>As indicated, the layout representing the construction camp is not</p>	<p>Continuous Monitoring is required.</p> <ul style="list-style-type: none"> ∫ Layout representing the Construction camp facilities should be immediately submitted to the PIU. ∫ Appropriate First Aid Kit should be made available at site ∫ Accident record should be maintained at site

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
	<p>construction. Safety and sanitation facility should be provided in the labour camp.</p> <p>Uncontaminated water shall be supplied to the construction workers at labour camps.</p> <p>The contractor shall arrange for - a readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone,</p> <p>Availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital.</p> <p>Always maintain a fully equipped first aid box in the construction camp. Proper waste management system must be enforced in the camp. So that waste is not haphazardly disposed of.</p>		<p>submitted to the PIU/PMU/PIC</p> <p>Potable water is supplied to the labours</p> <p>First aid kit is not available at site</p> <p>Health safety is lacking at the site. It needs improvement.</p>	
Community Health and Safety				
Construction activity of excavation and closure of road	Provide information about the construction schedule and construction activity Barricading construction site Display signage of diversion at construction road on embankment in consultation with local authority like traffic police, WRD and local community	Not Complied	Inadequate signages observed at site	Continuous Monitoring is required. ¿ Adequate signages should be provided at site.
Chance Findings				
Any construction activity	While excavating or dismantling any structure if any fossils, coins, articles of value / antiquity and remains of archaeological interest discovered on the site the contractor shall immediately stop work and inform the	Not applicable	Not envisaged at site	

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
	engineer from WRD. The Contractor shall take reasonable precautions to prevent his workmen or any other persons from damaging or removing any such articles. All work shall be stopped and WRD shall seek the direction of Archaeological Survey of India (ASI) before contractor recommences the work			
Operation Stage (Monitoring measures shall be taken up during the operation stage of the Project)		-	-	-
Regular maintenance of structures and canal	Regular checks by the respective PIU staffs	-	-	-
Increased agricultural activity	Training on improved agricultural practices. Continued monitoring of water quality at sample locations	-	-	-
changed salinity in tail end areas	Improved coordination between coastal aquaculture authority and WRD to ensure shrimp farmers adhere to laws and regulations.	-	-	-

3.1.4 Environmental Monitoring of the project

a. Noise (Analysis results enclosed in the Annexure - HR 7)

Location	Value		Standards
	Day	Night	
Keerandhi Regulator	55.2	47.2	As per the Schedule-VI ¹ (Part - E) of Environment (Protection) Rules, 1986. The Noise limits in dB(A) fixed for the Construction equipments (including Compactors(rollers), Front loaders, Concrete mixers, Cranes(movable), Vibrators and Saw) is 75 dB (A).
Althambady Regulator	54.4	49.4	
Brinjimoolai Regulator	55.6	47.4	
Harichandranadhi Tail End Regulator	55.2	47.8	
The observed values are found to be less than the prescribed limits in comparison with the CPCB Noise Quality Standard for Silent zone.			

b. Ambient Air Monitoring (Analysis results enclosed in the Annexure - HR 8)

Location	Parameter	Value	Standard value
Keerandhi Regulator	PM ₁₀ , $\mu\text{g}/\text{m}^3$	59.0	100.0
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	18.0	60.0
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	BDL	80.0
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	17.0	80.0
	Carbon monoxide, mg/m^3	BDL	4.0
Althambady Regulator	PM ₁₀ , $\mu\text{g}/\text{m}^3$	49.0	
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	20.0	
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	8.3	
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	14.0	
	Carbon monoxide, mg/m^3	BDL	
Brinjimoolai Regulator	PM ₁₀ , $\mu\text{g}/\text{m}^3$	49.0	
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	13.0	
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	9.0	
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	22.0	
	Carbon monoxide, mg/m^3	BDL	
Harichandranadhi Tail End Regulator	PM ₁₀ , $\mu\text{g}/\text{m}^3$	55.0	
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	16.0	
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	BDL	
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	13.0	
	Carbon monoxide, mg/m^3	BDL	
The observed AAQ values are within the regulatory standards indicating the construction activities, which does not have any impact on the existing air quality.			

c. Water Quality Monitoring (Analysis results enclosed in the Annexures - HR 9 and HR 10)

¿ Groundwater Quality

Sl.no	Parameter	Values				BIS Standard (IS 10500:1991)
		Keerandhi Regulator	Althambady Regulator	Brinjimoolai Regulator	Harichandranadhi Tail End Regulator	
1	pH at 25°C	7.46	7.16	7.38	7.11	6.5 to 8.5
2	Temperature °C	26.2	26.6	26.4	26.3	-
3	Electrical Conductivity μ mhos	1697	2369	1569	1460	-
4	Turbidity NTU	BDL	BDL	BDL	BDL	5
5	Total Dissolved Solids mg/l	1003	1407	930	856	2000
6	Total Suspended Solids mg/l	BDL	BDL	BDL	BDL	-
7	Dissolved Oxygen mg/l	5.7	6.2	5.8	5.6	-
8	Chemical Oxygen Demand mg/l	BDL	BDL	BDL	BDL	-
9	Biochemical Oxygen Demand mg/l	BDL	BDL	BDL	BDL	-
10	Fecal Coliform Nos/100ml	21	26	33	21	-

The observations from the groundwater quality analysis are

- i. The water quality remains in alkaline range (7 to 8 pH)
- ii. Turbidity is observed to be Below Detection Limit (BDL)
- iii. The Total Dissolved Solids (TDS) concentration in all the water samples are less than the stipulated standard (2000 mg/l)
- iv. The presence of Fecal Coliforms in all the samples indicates that the groundwater is contaminated by sewage leakage/ infiltration.

¿ Surface Water Quality

Sl.no	Parameter	Values				Standard IS: 2296
		Keerandhi Regulator	Althambady Regulator	Brinjimoolai Regulator	Harichandranadhi Tail End Regulator	
1	pH at 25°C	7.06	7.43	7.24	7.08	6.5 to 8.5
2	Temperature °C	26.3	26.3	26.5	26.4	-
3	Electrical Conductivity μ mhos	6156	1368	6246	3386	2500
4	Turbidity NTU	28	22	93	14	-
5	Total Dissolved Solids mg/l	3645	812	3656	1998	2100
6	Total Suspended Solids mg/l	37	11	175	28	-

7	Dissolved Oxygen mg/l	6.0	5.8	6.1	6.9	6
8	Chemical Oxygen Demand mg/l	26	20	57	127	-
9	Biochemical Oxygen Demand mg/l	9	6	18	24	2
10	Fecal Coliform Nos/100ml	26	17	22	34	50

The observations from the surface water quality analysis are

- i. Based on the recorded pH values, the water quality remains alkaline for all sampling locations
- ii. With exemption to the water sample collected at Althambady Regulator, all other water samples are recorded with high EC values, indicating the presence of salinity
- iii. Water samples collected at Althambady Regulator and Harichandra-nadhi Tail End are recorded with less TDS concentration. High concentration of TDS is recorded at Keerandhi Regulator and Brinjimoolai Regulator
- iv. The DO concentration is marginally high in comparison with the standard limit, indicating a healthier environment for aquatic ecosystem. However, the water quality analysis also shows an increased BOD indicating the surface water is contaminated by the organic pollution.
- v. The presence of Fecal Coliforms indicates sewage water contamination. However it is less than the prescribed limits

3.1.5 Environmental Grievance Record and Action Taken

Date	Project	Problem related to	Received through	Description	Status
	Package No. CW 1: Infrastructure Improvements and Reconstruction Works on Harichandranadhi from LS 121.260Km to 160.200Km & Law ford Straight Cut from LS 0 to 3.900Km	None	NA	NA	No Grievances have been recorded so far.

3.2 Package No. CW 2 - CAVSCD/TN/ADP (Infrastructure Improvements and Reconstruction Works on Adappar River from LS 130.236Km to 169.025 Km & Adappar Straight Cut from LS 0 to 2.40 Km

3.2.1 Compliance with Statutory Environmental Requirements

Sl.no	Clearance/ Approval Required	Compliance Status
1.	The EIA notification, 2006 (and its subsequent amendments)	Complied. Correspondence from Ministry of Environment, Forest and Climate Change (MoEF&CC), indicating the CAVSCD Project does not require Environmental Clearance is enclosed in the Annexure-1
2.	Coastal Regulation Zone (CRZ), 2011 (and subsequent amendments)	Complied, A section of the project area (at the tail end) falls under the CRZ and accordingly CRZ clearance has been obtained (Refer Annexure-2)
3.	Forest (Conservation) Act, 1980 and amendments and rules there in- (Forest Clearance for felling of forest trees)	Complied. Tree cutting clearance has been obtained from the forest department
4.	The Motor Vehicle Act, 1988 and subsequent amendments	Complied. All the construction vehicles are having appropriate permissions and permits (Refer Annexure - AD 1)
5.	Sourcing of construction materials (quarry and borrow materials)	<p>Complied.</p> <p>Borrow Earth</p> <p>(i) As per the records dt 06/07/2017 (available with PMU), a tank in Ovarur (village) located in Thiruthuraipondi (Taluk), Thiruvavur District has been identified for acquiring borrow earth.</p> <p>Sand Mining</p> <p>(i) Environmental clearance from SEIAA vide letter dated 09.05.2017 Lr.no 5956, 5957, 5958/EC1 (a)/3929/2017, the soil material is sourced from the Kollidam River, Nagapattinam District at</p> <ul style="list-style-type: none"> ζ Siddamalli Village (Mayiladuthurai Taluk) ζ Vadarangam Village (Sirkazhi Taluk) ζ Kadakkam Village (Mayiladuthurai Taluk) <p>(ii) Environmental clearance from SEIAA vide letter dated 21.06.2017 Lr. No SEIAA TN/F.No. 3223,3971/EC/1(a)/1817(A)/2014-1, the soil material is sourced from the Kollidam River, Thanjavur District at</p> <ul style="list-style-type: none"> ζ Nadupadugai Village (Papanasam Taluk) ζ Koviladi Village (Boothalur Taluk) <p>However, as per the instruction from Government of Tamil Nadu, sand is procured through online. A copy of the online receipt is given in the Annexure - AD 2.</p>
6.	Water (Prevention and control of pollution) Act, 1974 and	Complied. The Contractor is outsourcing the ready-mix concrete from a Private Batching Plant. Copy of Consent

Sl.no	Clearance/ Approval Required	Compliance Status
	Air (prevention and control of pollution) Act, 1981	to Operate received from the Tamil Nadu Pollution Control Board is given in the Annexure - AD 3.
7.	Noise Pollution (Regulation & Control) Rules ,2000	Complied. Based on the results of the Environmental Monitoring conducted for Noise Quality, it is observed that the values are less than the stipulated standard.
8.	Tamil Nadu Contract Labour (Regulation and Abolition) Rules and subsequent Amendments	Complied. As per the Act, labour license is obtained (refer Annexure - AD 4)
9.	Workmen's Compensation Act, 1923 and Subsequent amendments	Complied. As per the Act, labour insurance is obtained (refer Annexure - AD 5)
10.	The Wildlife Protection Act, 1972, amended in 2003 and 2006	Not applicable, as there are no ecological sensitive areas located within or in the surroundings of the project site

3.2.2 Compliance status with Loan Covenant

Sl. No.	Loan Agreement Reference	Environmental Compliance Requirements	Compliance Status
1.	Schedule 5, item 4 of Loan Agreement Safeguards and Social Environment	The Borrower shall ensure, or cause the EA to ensure, that the preparation, design, construction, implementation, operation and decommissioning of the Project facilities comply with (i) all applicable laws and regulations of the Borrower and the State relating to environment, health, and safety; (ii) the Environmental Safeguards; and (iii) all measures and requirements set forth in the IEE and the EMP, and any corrective or preventative actions set forth in a Safeguards Monitoring Report.	Complied
2.	Schedule 5, item 7 of Loan Agreement Human and Financial Resources to Implement Safeguards Requirements	The Borrower shall make available, or cause the EA to make available, all necessary budgetary and human resources to fully implement the EMP, the RP and the IPP if and as required. The EA shall designate at least one expert each to supervise implementation of the EMP, and the RP.	Complied Environmental Specialist and R&R Specialist has been appointed by the PMU to supervise the implementation of the EMP and RP.
3.	Schedule 5, item 8 of Loan Agreement	The Borrower shall, or cause the EA to ensure, that all bidding documents and contracts for Works contain provisions that require contractors to:	

Sl. No.	Loan Agreement Reference	Environmental Compliance Requirements	Compliance Status
	Safeguards - Related Provisions in Bidding Documents and Works Contracts	<p>a) Comply with the measures and requirements relevant to the contractor set forth in the IEE, the EMP, and the RP and the IPP as applicable (to the extent they concern impacts on affected people during construction), and any corrective or preventative actions set out in a Safeguards Monitoring Report;</p> <p>b) Make available a budget for all such environmental and social measures;</p> <p>c) Provide the WRD with a written notice of any unanticipated environmental, resettlement or indigenous peoples risks if any, or impacts that arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP, and the RP or the IPP if any;</p> <p>d) Adequately details the condition of roads, agricultural land and other infrastructure prior to starting to transport materials and construction; and</p> <p>e) Fully reinstate pathways, other local infrastructure, and agricultural land to at least their pre-Project condition upon the completion of construction.</p>	<p>Complied, Environmental management plan along with the monitoring plan is enclosed in the bid document as a supplementary Information</p> <p>Complied, exclusive EMP budget is not available. However, the cost for implementing the EMP is included in the contractor cost. For social, separate RP budget is available</p> <p>Not envisaged</p> <p>Complied, the existing landuse is studied and accordingly the construction activities are planned</p> <p>It will be addressed upon completion of construction</p>
4.	Schedule 5, item 9 of Loan Agreement Safeguards Monitoring and Reporting	<p>The Borrower shall do, or cause the EA to do, the following:</p> <p>a) Submit semi-annually Safeguards Monitoring Reports (one each for the resettlement and environment matters) to ADB and disclose relevant information from such reports to affected persons promptly upon submission;</p> <p>b) If any unanticipated environmental and/or social risks and impacts arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP, and (9d)the RP or the IPP as applicable, promptly inform ADB of the occurrence of such risks or impacts, with detailed</p>	<p>Partially Complied, Semiannual report on the Resettlement is submitted. However, due to the unavailability of the Environmental expert, semi-annual report of the environment is not submitted.</p> <p>Complied, as of now there is no unanticipated environmental and/or social risks and impacts raised. If such impacts arises in future, it shall be informed to the ADB.</p>

Sl. No.	Loan Agreement Reference	Environmental Compliance Requirements	Compliance Status
		<p>description of the event and proposed corrective action plan;</p> <p>c) No later than award of Works contract/commencement of land acquisition and resettlement activities under the Project engage a qualified and experienced external expert or NGO under a selection process and terms of reference acceptable to ADB, to verify information produced through Project monitoring process, and facilitate the carrying out of any verification activities by such external expert/NGO for the Project; and</p> <p>d) Report any breach of compliance with the measures and requirements set forth in the EMP, and the RP or the IPP if any, promptly after becoming aware of the breach.</p>	<p>Complied, qualified NGO's are engaged to verify information produced through Project monitoring process</p> <p>Complied. Such situation does not arise</p>
5.	<p>Schedule 5, item 10 of Loan Agreement</p> <p>Prohibited List of Investments</p>	<p>The Borrower shall ensure, or cause the EA to ensure, that no proceeds of the loan under the Project are used to finance any activity included in the list of prohibited investment activities provided in Appendix 5 of the SPS.</p>	<p>Complied, provided ADB loan is spent for the CAVSCD Project</p>
6.	<p>Schedule 5, item 11 of Loan Agreement</p> <p>Labor Standards</p>	<p>The Borrower, State, and WRD shall ensure that Works contracts under the Project follow all applicable labor laws of the Borrower and the State and that these further include provisions to the effect that contractors; (i) carry out HIV/AIDS awareness programs for labor and disseminate information at worksites on risks of sexually transmitted diseases and HIV/AIDS as part of health and safety measures for those employed during construction; and (ii) follow and implement all statutory provisions on labor (including not employing or using children as labor, equal pay for equal work), health, safety, welfare, sanitation, and working conditions. Such contracts shall also include clauses for termination in case of any breach of the stated provisions by the contractors.</p>	<p>Complied, appropriate Clauses (section 31, 32 and 33) is included under the general condition of the Contract for Labors.</p> <p>HIV/AIDS awareness programs are conducted for labors.</p> <p>Child labors are not engaged in the construction activities</p> <p>Appropriate clause for termination is included in the contract.</p>

3.2.3 Compliance with Project Environmental Management Plan (EMP)

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
Pre - Construction Stage				
Approvals and No Objection Certificate	Obtain CRZ Clearance Obtain Approval from Forest Department and Revenue Department for Felling of Trees	Complied	Satisfactory	General Conditions as stipulated in the Clearance should be adopted
Selection of Construction Camp for site office and storage of material, parking of vehicles and Workers Camp for labour to stay during non-working hours.	Since establishment of construction camp and labour camp are the decision of contractor. Selection of Construction camp and workers' camp away from the habitation area, Contractor to provide safe drinking water as per IS 10500 standards for drinking water. Provide sanitation for male and female workers. Collection and disposal of solid waste of the worker's camp	Partially Complied	<ul style="list-style-type: none"> ∩ Construction camp is located near the bank of the river (away from local settlements). ∩ Since local labours are engaged the necessity for labour camp does not arise. ∩ Labours are provided with drinking water facility. ∩ Sanitation facilities lacks at site. (no separate toilet provisions) ∩ Solid waste management at site needs improvement 	Continuous Monitoring is required
Identification of borrow pits and quarry area	Selection of Borrow pits for earth should be away from residential area, sensitive location, and local roads. Before selection of borrow area, the contractor will take written consent from the environmental officer of PMU. Selection of sand, stone and other quarry material will be only government approved sites only	Partially Complied	It is informed by the Contractor that appropriate NoC/ Permission has been obtained for Borrow area. However, evidence for the same is not submitted	Continuous Monitoring is required
Intervention with Utility	The contractor will identify water supply pipes, electrical poles, cables and access roads and bridges and prepare plans for shifting or reconstruction	Complied	Shifting of utilities are carried out by the concerned line departments.	Continuous Monitoring is required
Construction Stage				
Ambient Air Quality and Noise				

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
De-silting and resection of river	Dust suppression by sprinkling of water Provide dust curtain or geotextile membrane to cover soil.	Partially Complied	Water sprinkling should be performed more frequently and construction materials including soil, cement, and aggregate should be fully covered.	Continuous Monitoring is required
Transportation of construction material, borrow earth and river silts	Provide covered transportation of material and earth, Avoid haulage rout in residential area and sensitive locations	Not Complied	Vehicle carrying transportation materials are not covered	Continuous Monitoring is required
Operation of construction equipment's and vehicles	Maintenance of vehicles and equipment as per manufacturers guidelines and monitor emissions of the vehicles and equipment	Partially Complied	Routine maintenance of the construction vehicles should be carried out and appropriate register should be maintained	Continuous Monitoring is required
Quarrying and borrowing of earth for construction of embankment and road	<p>Quarrying of sand, stone and aggregates will only be from the government approved quarries. Operation and Rehabilitation of borrow area as per the Madras Detailed Standard Specification</p> <p>Arrangement for locating the source of supply of material for embankment and sub-grade as well as compliance to environmental requirements, as applicable shall be the sole responsibility of the contractor. WRD shall be required to inspect every borrow area location prior to approval.</p> <p>The Contractor shall not borrow earth from the selected borrow area until a formal agreement is signed between land owner and Contractor and a copy of this agreement is submitted to the concerned officer of WRD/Supervision Consultant</p>	Partially Complied	<p>It is informed by the Contractor that the Quarrying materials are being procured from authorized vendors. However substantial evidences (NoC from PCB, Mine departments etc..) are not submitted</p> <p>The borrow areas identified by the Contractor is verified by the PMU. It is also informed to the Contractor that the excavated soil if found suitable shall be utilized for construction works. Accordingly the excavated soil material is being used.</p> <p>Appropriate agreement/ MoU between the private land owners and the Contractor is yet to be furnished to the PMU/PIC</p>	Continuous Monitoring is required

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
	<p>Planning of haul roads for accessing borrow materials shall be undertaken during this stage. The haul roads shall be routed to avoid agricultural areas. In case agricultural land is disturbed, the Contractor shall rehabilitate as approved by the WRD/ Supervision Consultant and pay compensation for loss of cultivation to the users as per terms and conditions of the resettlement plan.</p> <p>All borrow areas whether in private, community or govt. land shall be restored either to the original condition or as per the approved by WRD/ Supervision Consultant</p>		<p>Existing road network is being used for transportation of the borrow material to the site</p> <p>The work is ongoing and during the completion all the borrow area that are used for this construction works shall be restored.</p>	
Soil Environment				
Standardisation of embankment and desilting of river and construction of road on one side embankment. Operation of borrow pits and transportation of material	<p>After cutting and filling embankment will be immediately stabilized</p> <p>Avoid de-silting within the flow of water.</p> <p>Encourage utilisation of river silt in gardening and other agricultural purpose identified in consultation with farmers.</p>	Complied	The excavated river silt is utilized for embankment strengthening.	Continuous Monitoring is required
Disposal of construction debris	Prohibition of throwing of construction debris in any sites other than the designated disposal sites identified at the detailed design stage The metallic waste will be recycled through vendors.	Partially Complied	Designated site for disposal of the construction debris is not identified.	Continuous Monitoring is required
Water Resource and Quality				

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
Resection and desilting of river Construction of tail-end regulators (TERs), Irrigation head sluices, drainage infalls, syphons, Bed dam, Grade dam, Chance spillage of oil, grease from heavy machineries, construction vehicles and equipment's	<p>Since the most of the construction work will take place in the lean season so mitigation measure of avoidance of desilting within the flow of water will minimise soil erosion and increase in turbidity in the downstream.</p> <p>Provide impermeable platform for storage and handling of oil and grease.</p>	Complied	<p>Construction works shall be performed during the lean season only.</p> <p>However, it is evident from the site that impermeable platform for storage and handling of oil and grease is not provided</p>	Continuous Monitoring is required
Biological Environment				
Clearance and grubbing of site for construction of embankment	<p>The removal of the cut trees by the forest department will be taken away by the forest department and it will be stored and later sold by the forest department according to their rules.</p> <p>The trees which are not planted by the forest department will be cut and removed by the contractor on permission of district revenue officer.</p> <p>Compensatory Plantation of 10:1 ratio meaning plantation of 10 trees in lieu of felling of 1 tree Forest Department will cut those trees which are planted by the forest department and its compensatory plantation will be done by the forest department. Other trees which are not planted by the forest department, WRD will do the compensatory plantation</p>	Complied	Trees falling in-between the River RoW are identified and compensation for the removal of trees as suggested by the Forest Department is paid. Presently, removal of trees/ cutting of Trees is under progress	Continuous Monitoring is required.
Occupation Health and Safety				
Occupational Health and Safety of labours at	Provide personal protective equipment to the labours.	Not Complied	Labours are not provided with appropriate PPE's. It is evident from the consultations held with	Continuous Monitoring is required.

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
<p>construction site and Labour camps</p>	<p>Ensure the labours are trained to work on the specific project. For untrained labour - training should be provided before permission to work on the site.</p> <p>The contractor shall provide, if required, erect and maintain necessary (temporary) living accommodation and ancillary facilities during the progress of work for labour to standards and scales approved by the PIU.</p> <p>Contractor shall follow all relevant provisions of the Factories Act, 1948 and the Building & other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction & maintenance of labor camp.</p> <p>Construction camps shall not be proposed within 1000m or sufficiently away from nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community.</p> <p>The location, layout and basic facility provision of each labour camp shall be submitted to Engineer prior to their construction. Safety and sanitation facility should be provided in the labour camp.</p> <p>Uncontaminated water shall be supplied to the construction workers at labour camps.</p> <p>The contractor shall arrange for - a readily available first aid unit including an adequate supply of</p>		<p>the labours that they lack training.</p> <p>Temporary labour shed lacks basic amenities. It is suggested to adopt the factory and labour act provisions for the labours.</p> <p>Construction camps are located away from the settlement sites</p> <p>As indicated, the layout representing the construction camp is not submitted to the PIU/PMU/PIC</p> <p>Potable water is supplied to the labours</p> <p>First aid kit is not available at site</p>	<ul style="list-style-type: none"> ζ Layout representing the Construction camp facilities should be immediately submitted to the PIU. ζ Appropriate First Aid Kit should be made available at site ζ Accident record should be maintained at site

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
	sterilized dressing materials and appliances as per the Factories Rules in every work zone, Availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital. Always maintain a fully equipped first aid box in the construction camp. Proper waste management system must be enforced in the camp. So that waste is not haphazardly disposed of.		Health & safety is lacking at the site. It needs improvement.	
Community Health and Safety				
Construction activity of excavation and closure of road	Provide information about the construction schedule and construction activity Barricading construction site Display signage of diversion at construction road on embankment in consultation with local authority like traffic police, WRD and local community	Not Complied	Inadequate signage 3 observed at site	Continuous Monitoring is required. 2 Adequate signage 3 should be provided at site.
Chance Findings				
Any construction activity	While excavating or dismantling any structure if any fossils, coins, articles of value / antiquity and remains of archaeological interest discovered on the site the contractor shall immediately stop work and inform the engineer from WRD. The Contractor shall take reasonable precautions to prevent his workmen or any other persons from damaging or removing any such articles. All work shall be stopped and WRD shall seek the direction of Archaeological Survey of India (ASI) before contractor recommences the work	Not applicable	Not envisaged at site	

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
Operation Stage				
Regular maintenance of structures and canal	Regular checks by the respective PIU staffs	-	-	-
Increased agricultural activity	Training on improved agricultural practices. Continued monitoring of water quality at sample locations	-	-	-
changed salinity in tail end areas	Improved coordination between coastal aquaculture authority and WRD to ensure shrimp farmers adhere to laws and regulations.	-	-	-

3.2.4 Environmental Monitoring of the project

a. Noise (Analysis results enclosed in the Annexure - AD 6)

Location	Value		Standards
	Day	Night	
Thiruvananthuli	52.3	45.9	As per the Schedule-VI ² (Part - E) of Environment (Protection) Rules, 1986. The Noise limits in dB(A) fixed for the Construction equipments (including Compactors(rollers), Front loaders, Concrete mixers, Cranes(movable), Vibrators and Saw) is 75 dB (A)
Pamani	57.7	54.8	
Umbalacheri	53.9	49.2	
Adappar Tail End Regulator	53.1	45.2	
The observed values are found to be less than the prescribed limits in comparison with the CPCB Noise Quality Standard for Silent zone.			

b. Ambient Air Monitoring (Analysis results enclosed in the Annexure - AD 7)

Location	Parameter	Value	Standard value
Thiruvananthuli	PM ₁₀ , $\mu\text{g}/\text{m}^3$	52.0	100.0
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	21.0	60.0
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	BDL	80.0
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	12.0	80.0
	Carbon monoxide, mg/m^3	BDL	4.0
Pamani	PM ₁₀ , $\mu\text{g}/\text{m}^3$	63.0	
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	23.0	
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	9.4	
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	16	
	Carbon monoxide, mg/m^3	BDL	
Umbalacheri	PM ₁₀ , $\mu\text{g}/\text{m}^3$	45.0	
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	14.0	
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	BDL	
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	19.0	
	Carbon monoxide, mg/m^3	BDL	
Adappar Tail End Regulator	PM ₁₀ , $\mu\text{g}/\text{m}^3$	50.0	
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	12.0	
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	BDL	
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	16.0	
	Carbon monoxide, mg/m^3	BDL	
The observed AAQ values are within the regulatory standards indicating the construction activities, which does not have any impact on the existing air quality.			

c. Water Quality Monitoring (Analysis results enclosed in the Annexures - AD 8 and AD 9)

¿ Groundwater Quality

Sl.no	Parameter	Values				BIS Standard (IS 10500:1991)
		Thagara-vali	Pamani	Umbalacheri	Adappar Tail End	
1	pH at 25°C	7.06	7.36	7.18	7.76	6.5 to 8.5

Sl.no	Parameter	Values				BIS Standard (IS 10500:1991)
		Thagara-vali	Pamani	Umbalacheri	Adappar Tail End	
2	Temperature °C	26.3	26.0	26.5	26.7	-
3	Electrical Conductivity µmhos	2896	1546	3016	2903	-
4	Turbidity NTU	BDL	BDL	BDL	BDL	5
5	Total Dissolved Solids mg/l	1806	906	1769	1726	2000
6	Total Suspended Solids mg/l	BDL	BDL	BDL	BDL	-
7	Dissolved Oxygen mg/l	6.0	5.9	6.9	6.1	-
8	Chemical Oxygen Demand mg/l	BDL	BDL	BDL	BDL	-
9	Biochemical Oxygen Demand mg/l	BDL	BDL	BDL	BDL	-
10	Fecal Coliform Nos/100ml	27	13	33	27	-

The observations from the groundwater quality analysis are

- i. The water quality remains in alkaline range (7 to 8 pH)
- ii. Turbidity is observed to be Below Detection Limit (BDL)
- iii. The Total Dissolved Solids (TDS) concentration in all the water samples are less than the stipulated standard (2000 mg/l)
- iv. The presence of Fecal Coliforms in all the samples indicates that the groundwater is contaminated by sewage leakage/ infiltration.

ζ Surface Water Quality

Sl.no	Parameter	Values				Standard IS: 2296
		Thagaravali	Pamani	Umbalacheri	Adappar Tail End	
1	pH at 25°C	7.34	7.14	7.69	7.26	6.5 to 8.5
2	Temperature °C	26.6	26.4	26.3	26.5	-
3	Electrical Conductivity µmhos	3005	1756	6703	79630	2500
4	Turbidity NTU	10.2	1.9	19.8	43	-
5	Total Dissolved Solids mg/l	1801	1047	3806	46982	2100
6	Total Suspended Solids mg/l	14.4	704	26.5	108	-
7	Dissolved Oxygen mg/l	6.3	6.8	6.9	6.7	6
8	Chemical Oxygen Demand mg/l	24	19	39	27	-
9	Biochemical Oxygen Demand mg/l	8	6	12	9.5	2
10	Fecal Coliform Nos/100ml	11	9	14	26	50

The observations from the surface water quality analysis are

- i. Based on the recorded pH values, the water quality remains alkaline for all sampling locations
- ii. With exemption to the water sample collected at Pamani, all other water samples are recorded with high EC values

- iii. Water samples collected at Thagaravali and Pamani are recorded with less TDS concentration. Very high TDS concentration was recorded at Adappar Tail End, indicating strong influence of sea water Intrusion.
- iv. The DO concentration is marginally high in comparison with the standard limit, indicating a healthier environment for aquatic ecosystem. However, the water quality analysis also shows an increased BOD indicating the surface water is contaminated by the organic pollution.
- v. The presence of Fecal Coliforms indicates sewage water contamination. However it is less than the prescribed limits

3.2.5 Environmental Grievance Record and Action Taken

Date	Project	Problem related to	Received through	Description	Status
	Package No. CW 2: Infrastructure Improvements and Reconstruction Works on Adappar River from LS 130.236Km to 169.025 Km & Adappar S traight Cut from LS 0 to 2.40 Km	None	NA	NA	No Grievances have been recorded so far.

3.3 Package No. CW 3 - CAVSCD/TN/WR (Infrastructure Improvements and Reconstruction Works on Vellaiyar River from LS 111.650Km to 153.650Km)

3.3.1 Compliance with Statutory Environmental Requirements

Sl.no	Clearance/Approval Required	Compliance Status
1.	The EIA notification, 2006 (and its subsequent amendments)	Complied. Correspondence from Ministry of Environment, Forest and Climate Change (MoEF&CC), indicating the CAVSCD Project does not require Environmental Clearance and it is enclosed in the Annexure-1
2.	Coastal Regulation Zone (CRZ), 2011 (and subsequent amendments)	Complied, A section of the project area (at the tail end) falls under the CRZ and accordingly CRZ clearance has been obtained (Refer Annexure-2)
3.	Forest (Conservation) Act, 1980 and amendments and rules there in- (Forest Clearance for felling of forest trees)	Complied. Tree cutting clearance has been obtained from the Forest Department
4.	The Motor Vehicle Act, 1988 and subsequent amendments	Complied. All the construction vehicles are having appropriate permissions and permits (Refer Annexure - VR 1)
5.	Sourcing of construction materials (quarry and borrow materials)	<p>Complied.</p> <p>Borrow Material</p> <p>(i) As per the records dt 06/07/2017, a tank in Keeraneri village located in Kivelur (Taluk), Nagapattinam District has been identified for acquiring borrow earth.</p> <p>Sand Mining</p> <p>(i) Environmental clearance from SEIAA vide letter dated 09.05.2017 Lr.no 5956, 5957, 5958/EC 1 (a)/3929/2017, the soil material is sourced from the Kollidam River, Nagapattinam District at</p> <ul style="list-style-type: none"> ζ Siddamalli Village (Mayiladuthurai Taluk) ζ Vadarangam Village (Sirkazhi Taluk) ζ Kadakkam Village (Mayiladuthurai Taluk) <p>(ii) Environmental clearance from SEIAA vide letter dated 21.06.2017 Lr. No SEIAA TN/F.No. 3223,3971/EC/1(a)/1817(A)/2014-1, the soil material is sourced from the Kollidam River, Thanjavur District at</p> <ul style="list-style-type: none"> ζ Nadupadugai Village (Papanasam Taluk) ζ Koviladi Village (Boothalur Taluk) <p>However, as per the instruction from Government of Tamil Nadu, sand is procured through online. A copy of the online receipt is given in the Annexure -VR 2.</p>
6.	Water (Prevention and control of pollution) Act, 1974 and	Complied. The Contractor is outsourcing the ready-mix concrete from a Private Batching Plant. Copy of Consent

Sl.no	Clearance/ Approval Required	Compliance Status
	Air (prevention and control of pollution) Act, 1981	to Operate received from the Tamil Nadu Pollution Control Board is given in the Annexure - VR 3
7.	Noise Pollution (Regulation & Control) Rules, 2000	Complied. Based on the results of the Environmental Monitoring conducted for Noise Quality, it is observed that values are less than the stipulated standard.
8.	Tamil Nadu Contract Labour (Regulation and Abolition) Rules and subsequent Amendments	Complied. As per the Act, labour license is obtained (refer Annexure - VR 4)
9.	Workmen's Compensation Act, 1923 and Subsequent amendments	Complied. As per the Act, labour insurance is obtained (refer Annexure - VR 5)
10.	The Wildlife Protection Act, 1972, amended in 2003 and 2006	Not applicable, as there are no ecological sensitive areas located within or in the surroundings of the project site

3.3.2 Compliance status with Loan Covenant

Sl. No.	Loan Agreement Reference	Environmental Compliance Requirements	Compliance Status
1.	Schedule 5, item 4 of Loan Agreement Safeguards and Social Environment	The Borrower shall ensure, or cause the EA to ensure, that the preparation, design, construction, implementation, operation and decommissioning of the Project facilities comply with (i) all applicable laws and regulations of the Borrower and the State relating to environment, health, and safety; (ii) the Environmental Safeguards; and (iii) all measures and requirements set forth in the IEE and the EMP, and any corrective or preventative actions set forth in a Safeguards Monitoring Report.	Complied
2.	Schedule 5, item 7 of Loan Agreement Human and Financial Resources to Implement Safeguards Requirements	The Borrower shall make available, or cause the EA to make available, all necessary budgetary and human resources to fully implement the EMP, the RP and the IPP if and as required. The EA shall designate at least one expert each to supervise implementation of the EMP, and the RP.	Complied Environmental Specialist and R&R Specialist has been appointed by the PMU to supervise the implementation of the EMP and RP.
3.	Schedule 5, item 8 of Loan Agreement Safeguards - Related Provisions in Bidding	The Borrower shall, or cause the EA to ensure, that all bidding documents and contracts for Works contain provisions that require contractors to: a) Comply with the measures and requirements relevant to the contractor set forth in the IEE, the	Complied, Environmental management plan along with the monitoring plan is

Sl. No.	Loan Agreement Reference	Environmental Compliance Requirements	Compliance Status
	Documents and Works Contracts	<p>EMP, and the RP and the IPP as applicable (to the extent they concern impacts on affected people during construction), and any corrective or preventative actions set out in a Safeguards Monitoring Report;</p> <p>b) Make available a budget for all such environmental and social measures;</p> <p>c) Provide the WRD with a written notice of any unanticipated environmental, resettlement or indigenous peoples risks if any, or impacts that arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP, and the RP or the IPP if any;</p> <p>d) Adequately details the condition of roads, agricultural land and other infrastructure prior to starting to transport materials and construction; and</p> <p>e) Fully reinstate pathways, other local infrastructure, and agricultural land to at least their pre-Project condition upon the completion of construction.</p>	<p>enclosed in the bid document as a supplementary Information</p> <p>Complied, exclusive EMP budget is not available. However, the cost for implementing the EMP is included in the contractor cost. For social, separate RP budget is available</p> <p>Not envisaged</p> <p>Complied, the existing landuse is studied and accordingly the construction activities are planned</p> <p>It will be addressed upon completion of construction</p>
4.	Schedule 5, item 9 of Loan Agreement Safeguards Monitoring and Reporting	<p>The Borrower shall do, or cause the EA to do, the following:</p> <p>a) Submit semi-annually Safeguards Monitoring Reports (one each for the resettlement and environment matters) to ADB and disclose relevant information from such reports to affected persons promptly upon submission;</p> <p>b) If any unanticipated environmental and/or social risks and impacts arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP, and (9d)the RP or the IPP as applicable, promptly inform ADB of the occurrence of such risks or</p>	<p>Partially Complied, Semiannual report on the Resettlement is submitted. However, due to the unavailability of the Environmental expert, semi-annual report of the environment is not submitted.</p> <p>Complied, as of now there is no unanticipated environmental and/or social risks and impacts raised. If such impacts arises in future, it shall be informed to the ADB.</p>

Sl. No.	Loan Agreement Reference	Environmental Compliance Requirements	Compliance Status
		<p>impacts, with detailed description of the event and proposed corrective action plan;</p> <p>c) No later than award of Works contract/commencement of land acquisition and resettlement activities under the Project engage a qualified and experienced external expert or NGO under a selection process and terms of reference acceptable to ADB, to verify information produced through Project monitoring process, and facilitate the carrying out of any verification activities by such external expert/NGO for the Project; and</p> <p>d) Report any breach of compliance with the measures and requirements set forth in the EMP, and the RP or the IPP if any, promptly after becoming aware of the breach.</p>	<p>Complied, qualified NGO's are engaged to verify information produced through Project monitoring process</p> <p>Complied. Such situation does not arise</p>
5.	<p>Schedule 5, item 10 of Loan Agreement</p> <p>Prohibited List of Investments</p>	<p>The Borrower shall ensure, or cause the EA to ensure, that no proceeds of the loan under the Project are used to finance any activity included in the list of prohibited investment activities provided in Appendix 5 of the SPS.</p>	<p>Complied, provided ADB loan is spent for the CAVSCD Project</p>
6.	<p>Schedule 5, item 11 of Loan Agreement</p> <p>Labor Standards</p>	<p>The Borrower, State, and WRD shall ensure that Works contracts under the Project follow all applicable labor laws of the Borrower and the State and that these further include provisions to the effect that contractors; (i) carry out HIV/AIDS awareness programs for labor and disseminate information at worksites on risks of sexually transmitted diseases and HIV/AIDS as part of health and safety measures for those employed during construction; and (ii) follow and implement all statutory provisions on labor (including not employing or using children as labor, equal pay for equal work), health, safety, welfare, sanitation, and working conditions. Such contracts shall also include clauses for termination in case of any breach of the stated provisions by the contractors.</p>	<p>Complied, appropriate Clauses (section 31, 32 and 33) is included under the general condition of the Contract for Labors.</p> <p>HIV/AIDS awareness programs are conducted for labors.</p> <p>Child labors are not engaged in the construction activities</p> <p>Appropriate clause for termination is included in the contract.</p>

3.3.3 Compliance with Project Environmental Management Plan (EMP)

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
Pre - Construction Stage				
Approvals and No Objection Certificate	Obtain CRZ Clearance Obtain Approval from Forest Department and Revenue Department for Felling of Trees	Complied	Satisfactory	General Conditions as stipulated in the Clearance should be adopted
Selection of Construction Camp for site office and storage of material, parking of vehicles and Workers Camp for labour to stay during non-working hours.	Since establishment of construction camp and labour camp are the decision of contractor. Selection of Construction camp and workers camp away from the habitation area, Contractor to provide safe drinking water as per IS 10500 standards for drinking water. Provide sanitation for male and female workers. Collection and disposal of solid waste of the worker's camp	Partially Complied	<ul style="list-style-type: none"> ∩ Construction camp is located away from local settlements. ∩ Since local labours are engaged the necessity for labour camp does not arise. ∩ Labours are provided with drinking water facility. Sanitation facilities lacks at site ∩ Solid waste management at site needs improvement 	Continuous Monitoring is required
Identification of borrow pits and quarry area	Selection of Borrow pits for earth should be away from residential area, sensitive location, and local roads. Before selection of borrow area, the contractor will take written consent from the environmental officer of PMU. Selection of sand, stone and other quarry material will be only government approved sites only	Partially Complied	It is informed by the Contractor that appropriate NoC/ Permission has been obtained for Borrow area. However, evidence for the same is not submitted	Continuous Monitoring is required
Intervention with Utility	The contractor will identify water supply pipes, electrical poles, cables and access roads and bridges and prepare plans for shifting or reconstruction	Complied	Shifting of utilities are carried out by the concerned line departments.	Continuous Monitoring is required
Construction Stage				
Ambient Air Quality and Noise				
De-silting and resection of river	Dust suppression by sprinkling of water Provide dust curtain or geotextile membrane to cover soil.	Partially Complied	Water sprinkling should be performed more frequently and construction materials	Continuous Monitoring is required

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
			including soil should be covered.	
Transportation of construction material, borrow earth and river silts	Provide covered transportation of material and earth, Avoid haulage rout in residential area and sensitive locations	Not Complied	Vehicle carrying transportation materials are not covered	Continuous Monitoring is required
Operation of construction equipment's and vehicles	Maintenance of vehicles and equipment as per manufacturers guidelines and monitor emissions of the vehicles and equipment	Partially Complied	Routine maintenance of the construction vehicles should be carried out and appropriate register should be maintained	Continuous Monitoring is required
Quarrying and borrowing of earth for construction of embankment and road	<p>Quarrying of sand, stone and aggregates will only be from the government approved quarries.</p> <p>Operation and Rehabilitation of borrow area as per the Madras Detailed Standard Specification</p> <p>Arrangement for locating the source of supply of material for embankment and sub-grade as well as compliance to environmental requirements, as applicable shall be the sole responsibility of the contractor. WRD shall be required to inspect every borrow area location prior to approval.</p> <p>The Contractor shall not borrow earth from the selected borrow area until a formal agreement is signed between land owner and Contractor and a copy of this agreement is submitted to the concerned officer of WRD/Supervision Consultant</p> <p>Planning of haul roads for accessing borrow materials shall be undertaken during this stage. The haul roads shall be</p>	Partially Complied	<p>It is informed by the Contractor that the Quarrying materials are being procured from authorized vendors. However substantial evidences (NoC from SPCB, Mine departments etc.,) are not submitted</p> <p>The borrow areas identified by the Contractor is verified by the PMU. It is also informed to the Contractor that the excavated soil if found suitable shall be utilized for construction works. Accordingly the excavated soil material is being used.</p> <p>Appropriate agreement/ MoU between the private land owners and the Contractor is yet to be furnished to the PMU/PIC</p> <p>Existing road network is being used for transportation of the borrow material to the site</p>	Continuous Monitoring is required

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
	<p>routed to avoid agricultural areas. In case agricultural land is disturbed, the Contractor shall rehabilitate as approved by the WRD/Supervision Consultant and pay compensation for loss of cultivation to the users as per terms and conditions of the resettlement plan.</p> <p>All borrow areas whether in private, community or govt. land shall be restored either to the original condition or as per the approved by WRD/ Supervision Consultant</p>		The work is ongoing and during the completion all the borrow area that are used for this construction works shall be restored.	
Soil Environment				
Standardisation of embankment and desilting of river and construction of road on one side embankment. Operation of borrow pits and transportation of material	<p>After cutting and filling embankment will be immediately stabilized</p> <p>Avoid de-silting within the flow of water.</p> <p>Encourage utilisation of river silt in gardening and other agricultural purpose identified in consultation with farmers.</p>	Complied	The excavated river silt is utilized for embankment strengthening.	Continuous Monitoring is required
Disposal of construction debris	Prohibition of throwing of construction debris in any sites other than the designated disposal sites identified at the detailed design stage The metallic waste will be recycled through vendors.	Partially Complied	Designated site for disposal of the construction debris is not identified.	Continuous Monitoring is required
Water Resource and Quality				
Resection and desilting of river Construction of tail-end regulators (TERs), Irrigation head sluices, drainage infalls, syphons, Bed dam, Grade dam, Chance spillage of oil, grease from heavy machineries,	<p>Since the most of the construction work will take place in the lean season so mitigation measure of avoidance of desilting within the flow of water will minimise soil erosion and increase in turbidity in the downstream.</p> <p>Provide impermeable platform for storage and handling of oil and grease.</p>	Complied	<p>Construction works shall be performed during the lean season only.</p> <p>However, it is evident from the site that impermeable platform for storage and handling of oil and grease is not provided</p>	Continuous Monitoring is required

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
construction vehicles and equipment's				
Biological Environment				
Clearance and grubbing of site for construction of embankment	<p>The removal of the cut trees by the forest department will be taken away by the forest department and it will be stored and later sold by the forest department according to their rules.</p> <p>The trees which are not planted by the forest department will be cut and removed by the contractor on permission of district revenue officer.</p> <p>Compensatory Plantation of 10:1 ratio meaning plantation of 10 trees in lieu of felling of 1 tree Forest Department will cut those trees which are planted by the forest department and its compensatory plantation will be done by the forest department. Other trees which are not planted by the forest department, WRD will do the compensatory plantation</p>	Complied	Trees falling in-between the River RoW are identified and compensation for the removal of trees as suggested by the Forest Department is paid. Presently, removal of trees/ cutting of Trees is under progress	Continuous Monitoring is required.
Occupation Health and Safety				
Occupational Health and Safety of labours at construction site and Labour camps	<p>Provide personal protective equipment to the labours. Ensure the labours are trained to work on the specific project. For untrained labour - training should be provided before permission to work on the site. The contractor shall provide, if required, erect and maintain necessary (temporary) living accommodation and ancillary facilities during the progress of</p>	Not Complied	<p>Labours are not provided with appropriate PPE's. It is evident from the consultations that the labourers lack training.</p> <p>Temporary labour shed lacks basic amenities. It is suggested to adopt the factory and labour act provisions for the labours.</p>	<p>Continuous Monitoring is required.</p> <p>∩ Layout representing the Construction camp facilities should be immediately submitted to the PIU.</p>

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
	<p>work for labour to standards and scales approved by the PIU. Contractor shall follow all relevant provisions of the Factories Act, 1948 and the Building & other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction & maintenance of labor camp.</p> <p>Construction camps shall not be proposed within 1000m or sufficiently away from nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community.</p> <p>The location, layout and basic facility provision of each labour camp shall be submitted to Engineer prior to their construction. Safety and sanitation facility should be provided in the labour camp.</p> <p>Uncontaminated water shall be supplied to the construction workers at labour camps.</p> <p>The contractor shall arrange for - a readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone,</p> <p>Availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital.</p> <p>Always maintain a fully equipped first aid box in the construction camp. Proper waste management system must be</p>		<p>Construction camps are located away from the settlement sites</p> <p>As indicated, the layout representing the construction camp is not submitted to the PIU/PMU/PIC</p> <p>Potable water is supplied to the labours</p> <p>First aid kit is not available at site</p> <p>Health safety is lacking at the site. It needs improvement.</p>	<p>∫ Appropriate First Aid Kit should be made available at site</p> <p>∫ Accident record should be maintained at site</p>

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
	enforced in the camp. So that waste is not haphazardly disposed of.			
Community Health and Safety				
Construction activity of excavation and closure of road	Provide information about the construction schedule and construction activity Barricading construction site Display signage of diversion at construction road on embankment in consultation with local authority like traffic police, WRD and local community	Not Complied	Inadequate signage observed at site	Continuous Monitoring is required. Adequate signage should be provided at site.
Chance Findings				
Any construction activity	While excavating or dismantling any structure if any fossils, coins, articles of value / antiquity and remains of archaeological interest discovered on the site the contractor shall immediately stop work and inform the engineer from WRD. The Contractor shall take reasonable precautions to prevent his workmen or any other persons from damaging or removing any such articles. All work shall be stopped and WRD shall seek the direction of Archaeological Survey of India (ASI) before contractor recommences the work	Not applicable	Not envisaged at site	
Operation Stage				
Regular maintenance of structures and canal	Regular checks by the respective PIU staffs	-	-	-
Increased agricultural activity	Training on improved agricultural practices. Continued monitoring of water quality at sample locations	-	-	-
changed salinity in tail end areas	Improved coordination between coastal aquaculture authority and WRD to ensure shrimp farmers adhere to laws and regulations.	-	-	-

3.3.4 Environmental Monitoring of the project

a. Ambient Air Monitoring (Analysis results enclosed in the Annexure -VR 6)

Location	Parameter	Value	NAAQS 2009
Ayikudi Village	PM ₁₀ , $\mu\text{g}/\text{m}^3$	57.0	100.0
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	22.0	60.0
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	8.2	80.0
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	15.0	80.0
	Carbon monoxide, mg/m^3	BDL	4.0
Attur Bridge	PM ₁₀ , $\mu\text{g}/\text{m}^3$	47.0	
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	20.0	
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	9.2	
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	17.0	
	Carbon monoxide, mg/m^3	BDL	
Valivalam Village	PM ₁₀ , $\mu\text{g}/\text{m}^3$	47.0	
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	17.0	
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	BDL	
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	15.0	
	Carbon monoxide, mg/m^3	BDL	
Earuvakkadu Village	PM ₁₀ , $\mu\text{g}/\text{m}^3$	46.0	
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	16.0	
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	BDL	
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	19.0	
	Carbon monoxide, mg/m^3	BDL	

The observed Ambient Air Quality (AAQ) values are well within the regulatory standards indicating that the construction activities do not have any impact on the existing air quality in the surrounding.

b. Noise (Analysis results enclosed in the Annexure -VR 7)

Location	Value		Standards
	Day	Night	
Ayikudi Village	55.5	46.2	As per the Schedule-VI ³ (Part - E) of Environment (Protection) Rules, 1986. The Noise limits in dB(A) fixed for the Construction equipment's (including Compactors(rollers), Front loaders, Concrete mixers, Cranes(movable), Vibrators and Saw) is 75 dB (A)
Attur Bridge	54.3	50.1	
Valivalam Village	59.0	53.7	
Earuvakkadu Village	53.2	44.2	

The observed noise levels are found to be less than the prescribed limits

c. Water Quality Monitoring (Analysis results enclosed in the Annexures - VR 8 & VR 9)

¿ Groundwater Quality

Sl.no	Parameter	Values				BIS Standard (IS 10500:1991)
		Ayikudi Village	Attur Bridge	Valivalam Village	Earuvakkadu Village	
1	pH at 25°C	7.27	7.15	7.60	6.81	6.5 to 8.5
2	Temperature °C	26.4	26.1	26.1	26.2	-

Sl.no	Parameter	Values				BIS Standard (IS 10500:1991)
		Ayikudi Village	Attur Bridge	Valivalam Village	Earuvakkadu Village	
3	Electrical Conductivity μ mhos	1956	3256	2986	2963	-
4	Turbidity NTU	BDL	BDL	BDL	BDL	5
5	Total Dissolved Solids mg/l	1156	1192	1756	1740	2000
6	Total Suspended Solids mg/l	BDL	BDL	BDL	BDL	-
7	Dissolved Oxygen mg/l	5.2	5.0	6.9	5.6	-
8	Chemical Oxygen Demand mg/l	BDL	BDL	BDL	BDL	-
9	Biochemical Oxygen Demand mg/l	BDL	BDL	BDL	BDL	-
10	Fecal Coliform Nos/100ml	21.0	27.0	17.0	30.0	-

The observations from the groundwater quality analysis are

- i. The water quality in the Earuvakkadu Village is observed to be acidic, rest of the sampling location shows alkaline range
- ii. The total dissolved solids (TDS) in all the water samples are within the stipulated standard limits
- iii. The presence of the Fecal Coliforms indicates that the groundwater is contaminated with the sewage water or due to anthropogenic activities
- iv. Rest of the water quality parameters are below deductible limits (BDL)

ζ Surface Water Quality

Sl.no	Parameter	Values				Standard IS: 2296
		Ayikudi Village	Attur Bridge	Valivalam Village	Earuvakkadu Village	
1	pH at 25°C	7.20	7.68	7.20	7.36	6.5 to 8.5
2	Temperature °C	26.1	25.3	26.2	26.5	-
3	Electrical Conductivity μ mhos	845	416	409	1560	2500
4	Turbidity NTU	14.3	15	31	7.4	-
5	Total Dissolved Solids mg/l	506	249	241	936	2100
6	Total Suspended Solids mg/l	19.6	22.0	71.0	16.0	-
7	Dissolved Oxygen mg/l	6.9	5.9	6.4	6.3	6
8	Chemical Oxygen Demand mg/l	27.0	32.0	40.0	12.0	-
9	Biochemical Oxygen Demand mg/l	9.0	10.0	12.0	6.0	2
10	Fecal Coliform Nos/100ml	<2	<2	<2	6	50

The observations from the surface water quality analysis are

- i. The water quality remains alkaline for all sampling locations
- ii. The recorded Electrical Conductivity is less than the stipulated standard
- iii. The recorded TDS is less than the stipulated standard limit of 2000mg/l
- iv. The DO concentration is marginally high in comparison with the standard limit, indicating a healthier environment for aquatic ecosystem. However, the water quality

analysis also shows an increased BOD indicating the surface water is contaminated by the organic pollution.

v. The presence of Fecal Coliforms in the water sample collected at Earuvakkadu Village indicates sewage water contamination. However it is less than the prescribed, limits

3.3.5 Environmental Grievance Record and Action Taken

Date	Project	Problem related to	Received through	Description	Status
	Package No. CW 3: Infrastructure Improvements and Reconstruction Works on Vellaiyar River from LS 111.650Km to 153.650Km	None	NA	NA	No Grievances have been recorded so far.

3.4 Package No. CW 4 - CAVSCD/TN/PDR (Infrastructure Improvements and Reconstruction Works on Pandavaiyar River from LS 109.270Km to 148.020Km)

3.4.1 Compliance with Statutory Environmental Requirements

Sl.no	Clearance/ Approval Required	Compliance Status
1.	The EIA notification, 2006 (and its subsequent amendments)	Complied. Correspondence from Ministry of Environment, Forest and Climate Change (MoEF&CC), indicates that the CAVSCD Project does not require Environmental Clearance and it is enclosed in the Annexure-1
2.	Coastal Regulation Zone (CRZ), 2011 (and subsequent amendments)	Complied, A section of the project area (at the tail end) falls under the CRZ and accordingly CRZ clearance has been obtained (Refer Annexure-2)
3.	Forest (Conservation) Act, 1980 and amendments and rules there in- (Forest Clearance for felling of forest trees)	Complied. Tree cutting clearance has been obtained from Forest Department for felling of trees falling within the RoW
4.	The Motor Vehicle Act, 1988 and subsequent amendments	Complied. All the construction vehicles are having appropriate permissions and permits (Refer Annexure - PR 1).
5.	Sourcing of construction materials (quarry and borrow materials)	<p>Complied.</p> <p>Borrow Earth</p> <p>(i) As per the records dt 06/07/2017 (available with PMU), the following borrow earth sites are identified</p> <ul style="list-style-type: none"> ∩ Thirumeni Eri (Mannargudi Taluk), Thiruvarur District ∩ Keeraneri Tank (Kilavelur Taluk), Nagapattinam District ∩ Koopatchikottai (Mannargudi Taluk), Thiruvarur District ∩ Karpidagai Village (Kilvelur Taluk), Nagapattinam District ∩ Thirumakottai Village, Thiruvarur District <p>Private land</p> <ul style="list-style-type: none"> ∩ Anaikuppam (Mannargudi Taluk), Thiruvarur District <p>Appropriate NoC/ Permission has been obtained (Refer Annexure - PR 2)</p> <p>Sand Mining</p> <p>(i) Environmental clearance from SEIAA vide letter dated 09.05.2017 Lr.no 5956, 5957, 5958/EC 1 (a)/3929/2017, the soil material is sourced from the Kollidam River, Nagapattinam District at</p> <ul style="list-style-type: none"> ∩ Siddamalli Village (Mayiladuthurai Taluk) ∩ Vadarangam Village (Sirkazhi Taluk)

Sl.no	Clearance/ Approval Required	Compliance Status
		<ul style="list-style-type: none"> ζ Kadakkam Village (Mayiladuthurai Taluk) (ii) Environmental clearance from SEIAA vide letter dated 21.06.2017 Lr. No SEIAA TN/F.No. 3223,3971/E C/1(a)/1817(A)/2014-1, the soil material is sourced from the Kollidam River, Thanjavur District at <ul style="list-style-type: none"> ζ Nadupadugai Village (Papanasam Taluk) ζ Koviladi Village (Boothalur Taluk) <p>However, as per the instruction from Government of Tamil Nadu, sand is procured through online. A copy of the online receipt is given in the Annexure - PR 3</p>
6.	Water (Prevention and control of pollution) Act, 1974 and Air (prevention and control of pollution) Act, 1981	<p>Complied. Batching Plant is not used by the Contractor and hence obtaining Consent to Operate is not required, instead AJAX machine (Self Loading Concrete Mixer) is used.</p> <p>The air quality and water quality monitoring conducted at the construction sites reveals that the construction activities do not have any significant impacts to the surroundings</p>
7.	Noise Pollution (Regulation & Control) Rules, 2000	Not Complied. Environmental Monitoring is not conducted for Noise Quality
8.	Tamil Nadu Contract Labour (Regulation and Abolition) Rules and subsequent Amendments	Complied. As per the Act, labour license is obtained (refer Annexure - PR 4)
9.	Workmen's Compensation Act, 1923 and Subsequent amendments	Complied. As per the Act, labour insurance is obtained (refer Annexure - PR 5)
10.	The Wildlife Protection Act, 1972, amended in 2003 and 2006	Not applicable, as there are no ecological sensitive areas located within or in the surroundings of the project site

3.4.2 Compliance status with Loan Covenant

Sl. No.	Loan Agreement Reference	Environmental Compliance Requirements	Compliance Status
1.	Schedule 5, item 4 of Loan Agreement Safeguards and Social Environment	<p>The Borrower shall ensure, or cause the EA to ensure, that the preparation, design, construction, implementation, operation and decommissioning of the Project facilities comply with</p> <ul style="list-style-type: none"> (i) all applicable laws and regulations of the Borrower and the State relating to environment, health, and safety; (ii) the Environmental Safeguards; and (iii) all measures and requirements set forth in the IEE and the EMP, and any 	Complied

Sl. No.	Loan Agreement Reference	Environmental Compliance Requirements	Compliance Status
		corrective or preventative actions set forth in a Safeguards Monitoring Report.	
2.	Schedule 5, item 7 of Loan Agreement Human and Financial Resources to Implement Safeguards Requirements	<p>The Borrower shall make available, or cause the EA to make available, all necessary budgetary and human resources to fully implement the EMP, the RP and the IPP if and as required.</p> <p>The EA shall designate at least one expert each to supervise implementation of the EMP, and the RP.</p>	Complied Environmental Specialist and R&R Specialist has been appointed by the PMU to supervise the implementation of the EMP and RP.
3.	Schedule 5, item 8 of Loan Agreement Safeguards - Related Provisions in Bidding Documents and Works Contracts	<p>The Borrower shall, or cause the EA to ensure, that all bidding documents and contracts for Works contain provisions that require contractors to:</p> <p>a) Comply with the measures and requirements relevant to the contractor set forth in the IEE, the EMP, and the RP and the IPP as applicable (to the extent they concern impacts on affected people during construction), and any corrective or preventative actions set out in a Safeguards Monitoring Report;</p> <p>b) Make available a budget for all such environmental and social measures;</p> <p>c) Provide the WRD with a written notice of any unanticipated environmental, resettlement or indigenous peoples risks if any, or impacts that arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP, and the RP or the IPP if any;</p> <p>d) Adequately details the condition of roads, agricultural land and other infrastructure prior to starting to transport materials and construction; and</p> <p>e) Fully reinstate pathways, other local infrastructure, and agricultural</p>	<p>Complied, Environmental management plan along with the monitoring plan is enclosed in the bid document as a supplementary Information</p> <p>Complied, exclusive EMP budget is not available. However, the cost for implementing the EMP is included in the contractor cost. For social, separate RP budget is available</p> <p>Not envisaged</p> <p>Complied, the existing landuse is studied and accordingly the construction activities are planned</p> <p>It will be addressed upon completion of construction</p>

Sl. No.	Loan Agreement Reference	Environmental Compliance Requirements	Compliance Status
		land to at least their pre-Project condition upon the completion of construction.	
4.	Schedule 5, item 9 of Loan Agreement Safeguards Monitoring and Reporting	<p>The Borrower shall do, or cause the EA to do, the following:</p> <p>a) Submit semi-annually Safeguards Monitoring Reports (one each for the resettlement and environment matters) to ADB and disclose relevant information from such reports to affected persons promptly upon submission;</p> <p>b) If any unanticipated environmental and/or social risks and impacts arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP, and (9d)the RP or the IPP as applicable, promptly inform ADB of the occurrence of such risks or impacts, with detailed description of the event and proposed corrective action plan;</p> <p>c) No later than award of Works contract/commencement of land acquisition and resettlement activities under the Project engage a qualified and experienced external expert or NGO under a selection process and terms of reference acceptable to ADB, to verify information produced through Project monitoring process, and facilitate the carrying out of any verification activities by such external expert/NGO for the Project; and</p> <p>d) Report any breach of compliance with the measures and requirements set forth in the EMP, and the RP or the IPP if any, promptly after becoming aware of the breach.</p>	<p>Partially Complied, Semiannual report on the Resettlement is submitted. However, due to the unavailability of the Environmental expert, semi-annual report of the environment is not submitted.</p> <p>Complied, as of now there is no unanticipated environmental and/or social risks and impacts raised. If such impacts arises in future, it shall be informed to the ADB.</p> <p>Complied, qualified NGO's are engaged to verify information produced through Project monitoring process</p> <p>Complied. Such situation does not arise</p>
5.	Schedule 5, item 10 of Loan Agreement Prohibited List of Investments	The Borrower shall ensure, or cause the EA to ensure, that no proceeds of the loan under the Project are used to finance any activity included in the list of prohibited investment activities provided in Appendix 5 of the SPS.	Complied, provided ADB loan is spent for the CAVSCD Project

Sl. No.	Loan Agreement Reference	Environmental Compliance Requirements	Compliance Status
6.	Schedule 5, item 11 of Loan Agreement Labor Standards	The Borrower, State, and WRD shall ensure that Works contracts under the Project follow all applicable labor laws of the Borrower and the State and that these further include provisions to the effect that contractors; (i) carry out HIV/AIDS awareness programs for labor and disseminate information at worksites on risks of sexually transmitted diseases and HIV/AIDS as part of health and safety measures for those employed during construction; and (ii) follow and implement all statutory provisions on labor (including not employing or using children as labor, equal pay for equal work), health, safety, welfare, sanitation, and working conditions. Such contracts shall also include clauses for termination in case of any breach of the stated provisions by the contractors.	Complied, appropriate Clauses (section 31, 32 and 33) is included under the general condition of the Contract for Labors. HIV/AIDS awareness programs are conducted for labors. Child labors are not engaged in the construction activities Appropriate clause for termination is included in the contract.

3.4.3 Compliance with Project Environmental Management Plan (EMP)

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
Pre - Construction Stage				
Approvals and No Objection Certificate	Obtain CRZ Clearance Obtain Approval from Forest Department and Revenue Department for Felling of Trees	Complied	Satisfactory	General Conditions as stipulated in the Clearance should be adopted
Selection of Construction Camp for site office and storage of material, parking of vehicles and Workers Camp for labour to stay during non-working hours.	Since establishment of construction camp and labour camp are the decision of contractor. Selection of Construction camp and workers' camp away from the habitation area, Contractor to provide safe drinking water as per IS 10500 standards for drinking water. Provide sanitation for male and female workers. Collection and disposal of solid waste of the worker's camp	Partially Complied	<ul style="list-style-type: none"> ∩ Construction camps are located away from local settlements. ∩ Since local labours are engaged the necessity for labour camp does not arise. ∩ Labours are provided with drinking water facility. ∩ Sanitation facilities lacks at site (No separate toilet facilities for female labours). ∩ Solid waste management at site needs improvement 	Continuous Monitoring is required
Identification of borrow pits and quarry area	Selection of Borrow pits for earth should be away from residential area, sensitive location, and local roads. Before selection of borrow area, the contractor will take written consent from the environmental officer of PMU. Selection of sand, stone and other quarry material will be only government approved sites only	Complied	Satisfactory	Continuous Monitoring is required
Intervention with Utility	The contractor will identify water supply pipes, electrical poles, cables and access roads and bridges and prepare plans for shifting or reconstruction	Complied	Shifting of utilities are carried out by the concerned line departments.	Continuous Monitoring is required
Construction Stage				
Ambient Air Quality and Noise				
De-silting and resection of river	Dust suppression by sprinkling of water Provide dust curtain or geotextile membrane to cover soil.	Partially Complied	Water sprinkling should be performed more frequently and construction materials	Continuous Monitoring is required

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
			including soil should be covered.	
Transportation of construction material, borrow earth and river silts	Provide covered transportation of material and earth, Avoid haulage rout in residential area and sensitive locations	Not Complied	Vehicle carrying transportation materials are not covered	Continuous Monitoring is required
Operation of construction equipment's and vehicles	Maintenance of vehicles and equipment as per manufacturers guidelines and monitor emissions of the vehicles and equipment	Partially Complied	Routine maintenance of the construction vehicles should be carried out and appropriate register should be maintained	Continuous Monitoring is required
Quarrying and borrowing of earth for construction of embankment and road	<p>Quarrying of sand, stone and aggregates will only be from the government approved quarries.</p> <p>Operation and Rehabilitation of borrow area as per the Madras Detailed Standard Specification</p> <p>Arrangement for locating the source of supply of material for embankment and sub-grade as well as compliance to environmental requirements, as applicable shall be the sole responsibility of the contractor. WRD shall be required to inspect every borrow area location prior to approval.</p> <p>The Contractor shall not borrow earth from the selected borrow area until a formal agreement is signed between land owner and Contractor and a copy of this agreement is submitted to the concerned officer of WRD/Supervision Consultant</p> <p>Planning of haul roads for accessing borrow materials shall be undertaken during this stage. The haul roads shall be routed to avoid agricultural areas. In case</p>	Complied	<p>NoC/ Permissions from the competent authority is obtained (Refer Annexure - PR 6)</p> <p>General conditions given in the lease / permission to operate the Borrow areas are followed</p> <p>All the borrow areas are identified by the contractor and it has been inspected by the PMU officials prior to approval.</p> <p>Necessary permissions from the land owners and competent authority has been obtained (Refer Annexure - PR 2)</p> <p>Existing road network is being used for transportation of the borrow material to the site</p>	

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
	<p>agricultural land is disturbed, the Contractor shall rehabilitate as approved by the WRD/ Supervision Consultant and pay compensation for loss of cultivation to the users as per terms and conditions of the resettlement plan.</p> <p>All borrow areas whether in private, community or govt. land shall be restored either to the original condition or as per the approved by WRD/ Supervision Consultant</p>		The work is ongoing and during the completion all the borrow area that are used for this construction works shall be restored.	
Soil Environment				
Standardisation of embankment and desilting of river and construction of road on one side embankment. Operation of borrow pits and transportation of material	<p>After cutting and filling embankment will be immediately stabilized</p> <p>Avoid de-silting within the flow of water.</p> <p>Encourage utilisation of river silt in gardening and other agricultural purpose identified in consultation with farmers.</p>	Complied	The excavated river silt is utilized for embankment strengthening.	Continuous Monitoring is required
Disposal of construction debris	Prohibition of throwing of construction debris in any sites other than the designated disposal sites identified at the detailed design stage The metallic waste will be recycled through vendors.	Partially Complied	Designated site for disposal of the construction debris is not identified.	Continuous Monitoring is required
Water Resource and Quality				
Resection and desilting of river Construction of tail-end regulators (TERs), Irrigation head sluices, drainage infalls, syphons, Bed dam, Grade dam, Chance spillage of oil, grease from heavy machineries, construction vehicles and equipment's	<p>Since the most of the construction work will take place in the lean season so mitigation measure of avoidance of desilting within the flow of water will minimise soil erosion and increase in turbidity in the downstream.</p> <p>Provide impermeable platform for storage and handling of oil and grease.</p>	Complied	Construction works shall be performed during the lean season only. However, it is evident from the site that impermeable platform for storage and handling of oil and grease is not provided	Continuous Monitoring is required

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
Biological Environment				
Clearance and grubbing of site for construction of embankment	<p>The removal of the cut trees by the forest department will be taken away by the forest department and it will be stored and later sold by the forest department according to their rules.</p> <p>The trees which are not planted by the forest department will be cut and removed by the contractor on permission of district revenue officer.</p> <p>Compensatory Plantation of 10:1 ratio meaning plantation of 10 trees in lieu of felling of 1 tree Forest Department will cut those trees which are planted by the forest department and its compensatory plantation will be done by the forest department. Other trees which are not planted by the forest department, WRD will do the compensatory plantation</p>	Complied	Trees falling in-between the River RoW are identified and compensation for the removal of trees as suggested by the Forest Department is paid. Presently, removal of trees/ cutting of Trees is under progress	Continuous Monitoring is required.
Occupation Health and Safety				
Occupational Health and Safety of labours at construction site and Labour camps	<p>Provide personal protective equipment to the labours. Ensure the labours are trained to work on the specific project. For untrained labour - training should be provided before permission to work on the site. The contractor shall provide, if required, erect and maintain necessary (temporary) living accommodation and ancillary facilities during the progress of work for labour to standards and scales approved by the PIU. Contractor shall follow all relevant provisions of the Factories Act, 1948 and</p>	Not Complied	<p>Labours are not provided with appropriate PPE š. It is evident from the consultations held with the labours that they lack training.</p> <p>Temporary labour shed lacks basic amenities. It is suggested to adopt the factory and labour act provisions for the labours.</p>	<p>Continuous Monitoring is required.</p> <p>¿ Layout representing the Construction camp facilities should be immediately submitted to the PIU.</p> <p>¿ Appropriate First Aid Kit should be made available at site</p>

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
	<p>the Building & other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction & maintenance of labor camp.</p> <p>Construction camps shall not be proposed within 1000m or sufficiently away from nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community.</p> <p>The location, layout and basic facility provision of each labour camp shall be submitted to Engineer prior to their construction. Safety and sanitation facility should be provided in the labour camp.</p> <p>Uncontaminated water shall be supplied to the construction workers at labour camps.</p> <p>The contractor shall arrange for - a readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone,</p> <p>Availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital.</p> <p>Always maintain a fully equipped first aid box in the construction camp. Proper waste management system must be enforced in the camp. So that waste is not haphazardly disposed of.</p>		<p>Construction camps are located away from the settlement sites</p> <p>As indicated, the layout representing the construction camp is not submitted to the PIU/PMU/PIC</p> <p>Potable water is supplied to the labours</p> <p>First aid kit is not available at site</p> <p>Dedicated transport facility for carrying the sick or injured person to nearby hospital is not available</p> <p>Health & safety is lacking at the site. It needs improvement.</p>	<p>⌋ Accident record should be maintained at site</p>
Community Health and Safety				
Construction activity of excavation and closure of road	Provide information about the construction schedule and construction activity Barricading construction site Display	Not Complied	Inadequate signage s are observed at site	Continuous Monitoring is required.

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
	signage of diversion at construction road on embankment in consultation with local authority like traffic police, WRD and local community			¿ Adequate signage should be provided at site.
Chance Findings				
Any construction activity	While excavating or dismantling any structure if any fossils, coins, articles of value / antiquity and remains of archaeological interest discovered on the site the contractor shall immediately stop work and inform the engineer from WRD. The Contractor shall take reasonable precautions to prevent his workmen or any other persons from damaging or removing any such articles. All work shall be stopped and WRD shall seek the direction of Archaeological Survey of India (ASI) before contractor recommences the work	Not applicable	Not envisaged at site	
Operation Stage				
Regular maintenance of structures and canal	Regular checks by the respective PIU staffs	-	-	-
Increased agricultural activity	Training on improved agricultural practices. Continued monitoring of water quality at sample locations	-	-	-
changed salinity in tail end areas	Improved coordination between coastal aquaculture authority and WRD to ensure shrimp farmers adhere to laws and regulations.	-	-	-

Sl.no	Parameter	Values				BIS Standard (IS 10500 :1991)
		Korada-cherry	Mangudi	Maruvathur	Eranyankudi	
3	Electrical Conductivity μ mhos	935	1263	2021	1765	-
4	Turbidity NTU	BDL	1.5	2.6	BDL	5
5	Total Dissolved Solids mg/l	542	732	1172	1023	2000
6	Total Suspended Solids mg/l	BDL	BDL	BDL	BDL	-
7	Dissolved Oxygen mg/l	6.1	6.8	6.2	6.0	-
8	Chemical Oxygen Demand mg/l	BDL	BDL	6.4	BDL	-
9	Biochemical Oxygen Demand mg/l	BDL	BDL	3.1	BDL	-
10	Fecal Coliform Nos/100ml	9	14	22	17	-

The observations from the groundwater quality analysis are

- i. The water quality remains in alkaline range (7 to 7.5 pH)
- ii. Turbidity is observed to be less than the prescribed limits
- iii. The Total Dissolved Solids (TDS) in all the water samples are within the stipulated standard limits
- iv. The presence of Fecal Coliforms in all the samples indicates that the groundwater is contaminated by sewage leakage/ infiltration.

ζ Surface Water Quality

Sl.no	Parameter	Values				Standard IS: 2296
		Korada-cherry	Mangudi	Pudhupathur	Old Edayur	
1	pH at 25°C	7.72	7.56	7.66	7.92	6.5 to 8.5
2	Temperature °C	25.9	26.0	25.0	26.0	-
3	Electrical Conductivity μ mhos	3112	603	1262	4026	2500
4	Turbidity NTU	5.6	6.1	5.8	9.2	-
5	Total Dissolved Solids mg/l	1731	350	707	2335	2100
6	Total Suspended Solids mg/l	12	11.1	8.2	13	-
7	Dissolved Oxygen mg/l	6.5	6.9	6.6	6.7	6
8	Chemical Oxygen Demand mg/l	18.1	16.0	13.4	15.4	-
9	Biochemical Oxygen Demand mg/l	6.2	5.2	4.7	5.6	2
10	Fecal Coliform Nos/100ml	<2	<2	<2	<2	50

The observations from the surface water quality analysis are

- i. The water quality remains alkaline for all sampling locations
- ii. Electrical Conductivity is very high for the samples taken at Koradacherry and Old Edayur, indicating the presence of salinity
- iii. The recorded TDS concentration is very high(exceeding the stipulated standard limit of 2000mg/l) for the sample collected at Old Edayur, indicating the presence of salinity due to the sea water intrusion
- iv. The DO concentration is marginally high for all samples indicating the presence of organic pollution.

Sl.no	Parameter	Values				Standard IS: 2296
		Korada-cherry	Mangudi	Pudhupathur	Old Edayur	
v.	The recorded BOD concentration indicates the surface water is contaminated by the organic pollution.					

3.4.5 Environmental Grievance Record and Action Taken

Date	Project	Problem related to	Received through	Description	Status
	Package No. CW 4: Infrastructure Improvements and Reconstruction Works on Pandavaiyar River from LS 109.270Km to 148.020Km	None	NA	NA	No Grievances have been recorded so far.

3.5 Package No. CW 5 - CAVSCD/TNWNR (Infrastructure Improvements and Reconstruction Works on Valavanar Drain from LS 0Km to 16.450km)

3.5.1 Compliance with Statutory Environmental Requirements

Sl.no	Clearance/Approval Required	Compliance Status
1.	The EIA notification, 2006 (and its subsequent amendments)	Complied. Correspondence from Ministry of Environment, Forest and Climate Change (MoEF&CC), indicating the CAVSCD Project does not require Environmental Clearance and it is enclosed in the Annexure-1
2.	Coastal Regulation Zone (CRZ), 2011 (and subsequent amendments)	Complied, A section of the project area (at the tail end) falls under the CRZ and accordingly CRZ clearance has been obtained (Refer Annexure-2)
3.	Forest (Conservation) Act, 1980 and amendments and rules there in- (Forest Clearance for felling of forest trees)	Complied. Tree cutting clearance has been obtained from the Forest Department
4.	The Motor Vehicle Act, 1988 and subsequent amendments	Complied. All the construction vehicles are having appropriate permissions and permits (Refer Annexure - VD 1).
5.	Sourcing of construction materials (quarry and borrow materials)	<p>Complied.</p> <p>Borrow Material</p> <p>(i) The desilted earth material from the Valavanar Drain (river bed at 8th km, 15th Km and 17th Km) is being used for embankment and bund formation works. However, in case of shortage of materials, separate borrow areas are being identified</p> <p>Sand Mining</p> <p>(i) Environmental clearance from SEIAA vide letter dated 21.06.2017 Lr. No SEIAA TN/F.No. 3223,3971/EC/1(a)/1817(A)/2014-1, the soil material is sourced from the Kollidam River, Thanjavur District at</p> <ul style="list-style-type: none"> ∩ Nadupadugai Village (Papanasam Taluk) ∩ Koviladi Village (Boothalur Taluk) <p>However, as per the instruction from Government of Tamil Nadu, sand is procured through online. A copy of the online receipt is given in the Annexure - VD 2</p>
6.	Water (Prevention and control of pollution) Act, 1974 and Air (prevention and control of pollution) Act, 1981	<p>Complied. Batching Plant is not used by the Contractor and hence obtaining Consent to Operate is not required, instead AJ AX machine (Self Loading Concrete Mixer) is used.</p> <p>The air quality and water quality monitoring conducted at the construction sites reveals that the construction activities do not have any significant impacts to the surroundings</p>

Sl.no	Clearance/Approval Required	Compliance Status
7.	Noise Pollution (Regulation & Control) Rules, 2000	Complied. As per the outcome of the Environmental Monitoring conducted for Noise Quality, the observed values are less than the stipulated standard.
8.	Tamil Nadu Contract Labour (Regulation and Abolition) Rules and subsequent Amendments	Complied. As per the Act, labour license is obtained (refer Annexure - VD 3)
9.	Workmen's Compensation Act, 1923 and Subsequent amendments	Complied. As per the Act, labour insurance is obtained (refer Annexure - VD 4)
10.	The Wildlife Protection Act, 1972, amended in 2003 and 2006	Not applicable, as there are no ecological sensitive areas located within or in the surroundings of the project site

3.5.2 Compliance status with Loan Covenant

Sl. No.	Loan Agreement Reference	Environmental Compliance Requirements	Compliance Status
1.	Schedule 5, item 4 of Loan Agreement Safeguards and Social Environment	The Borrower shall ensure, or cause the EA to ensure, that the preparation, design, construction, implementation, operation and decommissioning of the Project facilities comply with (i) all applicable laws and regulations of the Borrower and the State relating to environment, health, and safety; (ii) the Environmental Safeguards; and (iii) all measures and requirements set forth in the IEE and the EMP, and any corrective or preventative actions set forth in a Safeguards Monitoring Report.	Complied
2.	Schedule 5, item 7 of Loan Agreement Human and Financial Resources to Implement Safeguards Requirements	The Borrower shall make available, or cause the EA to make available, all necessary budgetary and human resources to fully implement the EMP, the RP and the IPP if and as required. The EA shall designate at least one expert each to supervise implementation of the EMP, and the RP.	Complied Environmental Specialist and R&R Specialist has been appointed by the PMU to supervise the implementation of the EMP and RP
3.	Schedule 5, item 8 of Loan Agreement Safeguards - Related Provisions in Bidding Documents and	The Borrower shall, or cause the EA to ensure, that all bidding documents and contracts for Works contain provisions that require contractors to: a) Comply with the measures and requirements relevant to the contractor set forth in the IEE, the EMP, and the RP and the IPP as applicable (to the extent they concern impacts on affected people	Complied, Environmental management plan along with the monitoring plan is enclosed in the bid

Sl. No.	Loan Agreement Reference	Environmental Compliance Requirements	Compliance Status
	Works Contracts	<p>during construction), and any corrective or preventative actions set out in a Safeguards Monitoring Report;</p> <p>b) Make available a budget for all such environmental and social measures;</p> <p>c) Provide the WRD with a written notice of any unanticipated environmental, resettlement or indigenous peoples risks if any, or impacts that arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP, and the RP or the IPP if any;</p> <p>d) Adequately details the condition of roads, agricultural land and other infrastructure prior to starting to transport materials and construction; and</p> <p>e) Fully reinstate pathways, other local infrastructure, and agricultural land to at least their pre-Project condition upon the completion of construction.</p>	<p>document as a supplementary Information</p> <p>Complied, exclusive EMP budget is not available. However, the cost for implementing the EMP is included in the Contractor cost. For social, separate RP budget is available</p> <p>Not envisaged</p> <p>Complied, the existing landuse is studied and accordingly the construction activities are planned</p> <p>It will be addressed upon completion of construction</p>
4.	<p>Schedule 5, item 9 of Loan Agreement</p> <p>Safeguards Monitoring and Reporting</p>	<p>The Borrower shall do, or cause the EA to do, the following:</p> <p>a) Submit semi-annually Safeguards Monitoring Reports (one each for the resettlement and environment matters) to ADB and disclose relevant information from such reports to affected persons promptly upon submission;</p> <p>b) If any unanticipated environmental and/or social risks and impacts arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP, and (9d)the RP or the IPP as applicable, promptly inform ADB of the occurrence of such risks or impacts, with detailed description of the event and proposed corrective action plan;</p>	<p>Partially Complied, Semiannual report on the Resettlement is submitted. However, due to the unavailability of the Environmental expert, semi-annual report of the environment is not submitted.</p> <p>Complied, as of now there is no unanticipated environmental and/or social risks and impacts raised. If such impacts arises in future, it shall be informed to the ADB.</p>

Sl. No.	Loan Agreement Reference	Environmental Compliance Requirements	Compliance Status
		<p>c) No later than award of Works contract/commencement of land acquisition and resettlement activities under the Project engage a qualified and experienced external expert or NGO under a selection process and terms of reference acceptable to ADB, to verify information produced through Project monitoring process, and facilitate the carrying out of any verification activities by such external expert/NGO for the Project; and</p> <p>d) Report any breach of compliance with the measures and requirements set forth in the EMP, and the RP or the IPP if any, promptly after becoming aware of the breach.</p>	<p>Complied, qualified NGO's are engaged to verify information produced through Project monitoring process</p> <p>Complied. Such situation does not arise</p>
5.	<p>Schedule 5, item 10 of Loan Agreement</p> <p>Prohibited List of Investments</p>	<p>The Borrower shall ensure, or cause the EA to ensure, that no proceeds of the loan under the Project are used to finance any activity included in the list of prohibited investment activities provided in Appendix 5 of the SPS.</p>	<p>Complied, provided ADB loan is spent for the CAVSCD Project</p>
6.	<p>Schedule 5, item 11 of Loan Agreement</p> <p>Labor Standards</p>	<p>The Borrower, State, and WRD shall ensure that Works contracts under the Project follow all applicable labor laws of the Borrower and the State and that these further include provisions to the effect that contractors; (i) carry out HIV/AIDS awareness programs for labor and disseminate information at worksites on risks of sexually transmitted diseases and HIV/AIDS as part of health and safety measures for those employed during construction; and (ii) follow and implement all statutory provisions on labor (including not employing or using children as labor, equal pay for equal work), health, safety, welfare, sanitation, and working conditions. Such contracts shall also include clauses for termination in case of any breach of the stated provisions by the contractors.</p>	<p>Complied, appropriate Clauses (section 31, 32 and 33) is included under the general condition of the Contract for Labors.</p> <p>HIV/AIDS awareness programs are conducted for labors (refer Annexure - VD 5).</p> <p>Child labors are not engaged in the construction activities</p> <p>Appropriate clause for termination is included in the contract.</p>

3.5.3 Compliance with Project Environmental Management Plan (EMP)

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
Pre - Construction Stage				
Approvals and No Objection Certificate	Obtain CRZ Clearance Obtain Approval from Forest Department and Revenue Department for Felling of Trees	Complied	Satisfactory	General Conditions as stipulated in the Clearance should be adopted
Selection of Construction Camp for site office and storage of material, parking of vehicles and Workers Camp for labour to stay during non-working hours.	Selection of Construction camp and workers camp away from the habitation area, Contractor to provide safe drinking water as per IS 10500 standards for drinking water. Provide sanitation for male and female workers. Collection and disposal of solid waste of the worker's camp	Complied	<ul style="list-style-type: none"> ∩ Construction camps are located away from local settlements. ∩ Since local labours are engaged the necessity for labour camp does not arise. However temporary labour resting sheds are provide ∩ Labours are provided with drinking water facility. ∩ Female labors are not engaged. ∩ Adequate toilet facility is provided at site ∩ Solid waste management at site needs improvement 	Continuous Monitoring is required
Identification of borrow pits and quarry area	Selection of Borrow pits for earth should be away from residential area, sensitive location, and local roads. Before selection of borrow area, the contractor will take written consent from the environmental officer of PMU. Selection of sand, stone and other quarry material will be only government approved sites only	Complied	The excavated earth material from the river bed is used for this project and hence identifying of borrow area is not envisaged	Continuous Monitoring is required
Intervention with Utility	The contractor will identify water supply pipes, electrical poles, cables and access roads and bridges and prepare plans for shifting or reconstruction	Complied	Shifting of utilities are carried out by the concerned line departments.	Continuous Monitoring is required
Construction Stage				
Ambient Air Quality and Noise				

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
De-silting and resection of river	Dust suppression by sprinkling of water Provide dust curtain or geotextile membrane to cover soil.	Complied	Water sprinkling is done at site however, the frequency should be increased and construction materials including soil, cement, aggregates should be covered.	Continuous Monitoring is required
Transportation of construction material, borrow earth and river silts	Provide covered transportation of material and earth, Avoid haulage rout in residential area and sensitive locations	Not Complied	Vehicle carrying transportation materials are not covered	Continuous Monitoring is required
Operation of construction equipment's and vehicles	Maintenance of vehicles and equipment as per manufacturers guidelines and monitor emissions of the vehicles and equipment	Complied	Routine maintenance of the construction vehicles should be carried out and appropriate register should be maintained	Continuous Monitoring is required
Quarrying and borrowing of earth for construction of embankment and road	<p>Quarrying of sand, stone and aggregates will only be from the government approved quarries.</p> <p>Operation and Rehabilitation of borrow area as per the Madras Detailed Standard Specification</p> <p>Arrangement for locating the source of supply of material for embankment and sub-grade as well as compliance to environmental requirements, as applicable shall be the sole responsibility of the contractor. WRD shall be required to inspect every borrow area location prior to approval.</p> <p>The Contractor shall not borrow earth from the selected borrow area until a formal agreement is signed between land owner and Contractor and a copy of this agreement is submitted to the concerned officer of WRD/Supervision Consultant</p>	Complied	<p>NoC/ Permissions from the competent authority is obtained.</p> <p>Usage of borrow area is not envisaged</p> <p>The contractor has identified the areas for excavation of earth materials from the river bed. It has been inspected and prior approval has been obtained from the PMU officials.</p>	Continuous Monitoring is required

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
	<p>Planning of haul roads for accessing borrow materials shall be undertaken during this stage. The haul roads shall be routed to avoid agricultural areas. In case agricultural land is disturbed, the Contractor shall rehabilitate as approved by the WRD/ Supervision Consultant and pay compensation for loss of cultivation to the users as per terms and conditions of the resettlement plan.</p> <p>All borrow areas whether in private, community or govt. land shall be restored either to the original condition or as per the approved by WRD/ Supervision Consultant</p>		<p>Existing road network is being used for transportation of the borrow material to the site</p> <p>The work is ongoing and during the completion all the borrow area that are used for this construction works shall be restored.</p>	
Soil Environment				
Standardisation of embankment and desilting of river and construction of road on one side embankment. Operation of borrow pits and transportation of material	<p>After cutting and filling embankment will be immediately stabilized</p> <p>Avoid de-silting within the flow of water.</p> <p>Encourage utilisation of river silt in gardening and other agricultural purpose identified in consultation with farmers.</p>	Complied	The excavated river silt is utilized for embankment strengthening.	Continuous Monitoring is required
Disposal of construction debris	Prohibition of throwing of construction debris in any sites other than the designated disposal sites identified at the detailed design stage The metallic waste will be recycled through vendors.	Partially Complied	Designated site for disposal of the construction debris is not identified.	Continuous Monitoring is required
Water Resource and Quality				
Resection and desilting of river Construction of tail-end regulators (TERs), Irrigation head sluices, drainage in falls, syphons, Bed dam,	Since the most of the construction work will take place in the lean season so mitigation measure of avoidance of desilting within the flow of water will minimise soil erosion and increase in turbidity in the downstream.	Complied	Construction works shall be performed during the lean season only. It is evident from the site that impermeable platform for storage and handling of oil and grease is provided	Continuous Monitoring is required

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
Grade dam, Chance spillage of oil, grease from heavy machineries, construction vehicles and equipment's	Provide impermeable platform for storage and handling of oil and grease.			
Biological Environment				
Clearance and grubbing of site for construction of embankment	<p>The removal of the cut trees by the forest department will be taken away by the forest department and it will be stored and later sold by the forest department according to their rules.</p> <p>The trees which are not planted by the forest department will be cut and removed by the contractor on permission of district revenue officer.</p> <p>Compensatory Plantation of 10:1 ratio meaning plantation of 10 trees in lieu of felling of 1 tree Forest Department will cut those trees which are planted by the forest department and its compensatory plantation will be done by the forest department. Other trees which are not planted by the forest department, WRD will do the compensatory plantation</p>	Complied	151 PWD trees has been removed from the River RoW. Appropriate permission is obtained from EE, Vennar Division through letter no 58 / 2017/D3 Dated 02.11.2017	Continuous Monitoring is required
Occupation Health and Safety				
Occupational Health and Safety of labours at construction site and Labour camps	<p>Provide personal protective equipment to the labours.</p> <p>Ensure the labours are trained to work on the specific project.</p> <p>For untrained labour - training should be provided before permission to work on the site.</p> <p>The contractor shall provide, if required, erect and maintain necessary (temporary)</p>	Complied	<p>Labours are provided with appropriate PPE's. However, it is evident from the consultations held with the labours that they lack training.</p> <p>Temporary labour sheds are provided with basic amenities.</p>	<p>Continuous Monitoring is required.</p> <p>Layout representing the Construction camp facilities should be immediately</p>

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
	<p>living accommodation and ancillary facilities during the progress of work for labour to standards and scales approved by the PIU.</p> <p>Contractor shall follow all relevant provisions of the Factories Act, 1948 and the Building & other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction & maintenance of labor camp.</p> <p>Construction camps shall not be proposed within 1000m or sufficiently away from nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community.</p> <p>The location, layout and basic facility provision of each labour camp shall be submitted to Engineer prior to their construction. Safety and sanitation facility should be provided in the labour camp. Uncontaminated water shall be supplied to the construction workers at labour camps. The contractor shall arrange for - a readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone,</p> <p>Availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital.</p> <p>Always maintain a fully equipped first aid box in the construction camp. Proper waste management system must be enforced in the camp. So that waste is not haphazardly disposed of.</p>		<p>The Contractor has followed relevant provisions as mentioned in the Factory Act 1948 (its amendments) and Building & other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996</p> <p>Construction camps are located away from the settlement sites</p> <p>The layout representing the construction camp is not submitted to the PIU/PMU/PIC</p> <p>Potable water is supplied to the labours</p> <p>First aid kit is available at site</p> <p>Health & safety management is adopted at the site. However. Improvement is required.</p> <p>Waste management system need improvement</p>	<p>submitted to the PIU/PMU.</p> <p>Accident record should be maintained at site</p>

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
Community Health and Safety				
Construction activity of excavation and closure of road	Provide information about the construction schedule and construction activity Barricading construction site Display signage of diversion at construction road on embankment in consultation with local authority like traffic police, WRD and local community	Partially Complied	Inadequate signage's are observed at site	Continuous Monitoring is required. ¿ Adequate signage's should be provided at site.
Chance Findings				
Any construction activity	While excavating or dismantling any structure if any fossils, coins, articles of value / antiquity and remains of archaeological interest discovered on the site the contractor shall immediately stop work and inform the engineer from WRD. The Contractor shall take reasonable precautions to prevent his workmen or any other persons from damaging or removing any such articles. All work shall be stopped and WRD shall seek the direction of Archaeological Survey of India (ASI) before contractor recommences the work	Not applicable	Not envisaged at site	
Operation Stage				
Regular maintenance of structures and canal	Regular checks by the respective PIU staffs	-	-	-
Increased agricultural activity	Training on improved agricultural practices. Continued monitoring of water quality at sample locations	-	-	-
changed salinity in tail end areas	Improved coordination between coastal aquaculture authority and WRD to ensure shrimp farmers adhere to laws and regulations.	-	-	-

3.5.4 Environmental Monitoring of the project

a. Noise (Analysis results enclosed in the Annexure - VD 6)

Location	Value		Standards
	Day	Night	
Thiruduraipoondi	49.9	44.2	As per the Schedule-VI ⁵ (Part - E) of Environment (Protection) Rules, 1986. The Noise limits in dB(A) fixed for the Construction equipments (including Compactors(rollers), Front loaders, Concrete mixers, Cranes(movable), Vibrators and Saw) is 75 dB (A)
Ekkal	49.2	43.0	
Thulasiyapattinam	52.1	43.3	
Power House (Voimadu)	51.1	45.2	
The observed values are found to be less than the prescribed noise limits			

b. Ambient Air Monitoring (Analysis results enclosed in the Annexure - VD 7)

Location	Parameter	Value	Standard value
Near Thiruduraipoondi	PM ₁₀ , $\mu\text{g}/\text{m}^3$	56.0	100.0
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	18.0	60.0
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	8.1	80.0
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	14.0	80.0
	Carbon monoxide, mg/m^3	BDL	4.0
Near Ekkal	PM ₁₀ , $\mu\text{g}/\text{m}^3$	52.0	
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	19.0	
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	8.6	
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	17.0	
	Carbon monoxide, mg/m^3	BDL	
Near Thulasiyapattinam	PM ₁₀ , $\mu\text{g}/\text{m}^3$	49.0	
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	14.0	
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	BDL	
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	12.0	
	Carbon monoxide, mg/m^3	BDL	
Near Power House (Voimadu)	PM ₁₀ , $\mu\text{g}/\text{m}^3$	55.0	
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	14.0	
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	9.1	
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	13.0	
	Carbon monoxide, mg/m^3	BDL	
The observed AAQ values are within the regulatory standards indicating the construction activities, does not have any impact on the existing air quality.			

c. Water Quality Monitoring (Analysis results enclosed in the Annexures - VD 8 and VD 9)

¿ Groundwater Quality

Sl.no	Parameter	Values				BIS Standard (IS 10500 :1991)
		Near Thiruduraipoondi	Near Ekkal	Near Thulasiyapattinam	Near Power House (Voimadu)	
1	pH at 25°C	6.54	7.63	6.70	7.19	6.5 to 8.5
2	Temperature °C	26.2	26.2	26.3	26.2	-

Sl.no	Parameter	Values				BIS Standard (IS 10500 :1991)
		Near Thirudurai-poondi	Near Ekkal	Near Thulasiya-pattinam	Near Power House (Voimadu)	
3	Electrical Conductivity μ mhos	4924	647	565	2485	-
4	Turbidity NTU	BDL	BDL	BDL	BDL	5
5	Total Dissolved Solids mg/l	2767	364	318	1401	2000
6	Total Suspended Solids mg/l	BDL	BDL	BDL	BDL	-
7	Dissolved Oxygen mg/l	6.4	6.9	7.1	5.8	-
8	Chemical Oxygen Demand mg/l	BDL	BDL	BDL	4	-
9	Biochemical Oxygen Demand mg/l	BDL	BDL	BDL	2.3	-
10	Fecal Coliform Nos/100ml	280	60	40	110	-

The observations from the groundwater quality analysis are

- The water quality at Thiruduripondi and Thulasiyapattinam shows acidic pH and water quality at Ekkal and Voimadu shows alkaline pH.
- Turbidity is Below Deductible Limits (BDL)
- The total dissolved solids (TDS) concentration at Thiruduripondi is exceeding the stipulated standard of 2000 mg/l. For other locations the TDS is well within the limits.
- The presence of Fecal Coliforms in all the samples indicates that the groundwater is contaminated by sewage leakage/ infiltration.

ζ Surface Water Quality

Sl.no	Parameter	Values				Standard IS: 2296
		Near Thirudurai-poondi	Near Ekkal	Near Thulasiya-pattinam	Near Power House (Voimadu)	
1	pH at 25°C	7.05	7.42	8.57	7.15	6.5 to 8.5
2	Temperature °C	26.3	26.1	26.2	26.2	-
3	Electrical Conductivity μ mhos	1401	33370	4729	23080	2500
4	Turbidity NTU	34.2	11.8	84.7	106	-
5	Total Dissolved Solids mg/l	785	18833	2664	12955	2100
6	Total Suspended Solids mg/l	27.2	30	107.2	289	-
7	Dissolved Oxygen mg/l	6.7	6.3	6.8	5.0	6
8	Chemical Oxygen Demand mg/l	8.0	279	65	163	-
9	Biochemical Oxygen Demand mg/l	3.0	55	13.5	16.5	2
10	Fecal Coliform Nos/100ml	90	<2	<2	240	50

The observations from the surface water quality analysis are

- The water quality remains alkaline for all sampling locations
- With exemption to the sample taken near Thiruduraipoondi, the recorded Electrical Conductivity is very high than the stipulated standard for all samples, indicating the presence of salinity
- With exemption to the sample taken near Thiruduraipoondi, the recorded TDS in other samples is very high than the stipulated standard limit of 2000mg/l, indicating the presence of salinity due to the sea water intrusion.

Sl.no	Parameter	Values				Standard IS: 2296
		Near Thirudurai-poondi	Near Ekkal	Near Thulasiya-pattinam	Near Power House (Voimadu)	
iv.	The DO concentration is marginally high for all samples indicating the presence of organic pollution.					
v.	The recorded BOD concentration indicates the surface water is contaminated by the organic pollution.					
vi.	The presence of fecal coliforms in samples collected at Thiruduraipoondi and Voimadu indicates the presence of sewage influence in the surface water.					

3.5.5 Environmental Grievance Record and Action Taken

Date	Project	Problem related to	Received through	Description	Status
	Package No. CW 5: Infrastructure Improvements and Reconstruction Works on Valavanar Drain from LS 0Km to 16.450km	None	NA	NA	No Grievances have been recorded so far.

3.6 Package No. CW 6 - CAVSCD/TNWRM (Infrastructure Improvements and Reconstruction Works on Vedaranyam Canal and Uppanar

3.6.1 Compliance with Statutory Environmental Requirements

Sl.no	Clearance/Approval Required	Compliance Status
1.	The EIA notification, 2006 (and its subsequent amendments)	Complied. Correspondence from Ministry of Environment, Forest and Climate Change (MoEF&CC), indicating the CAVSCD Project does not require Environmental Clearance is enclosed in the Annexure-1
2.	Coastal Regulation Zone (CRZ), 2011 (and subsequent amendments)	Complied, A section of the project area (at the tail end) falls under the CRZ and accordingly CRZ clearance has been obtained (Refer Annexure-2)
3.	Forest (Conservation) Act, 1980 and amendments and rules there in- (Forest Clearance for felling of forest trees)	Complied. Tree cutting clearance has been obtained from the Forest Department
4.	The Motor Vehicle Act, 1988 and subsequent amendments	Complied. All the construction vehicles are having appropriate permissions and permits (Refer Annexure - VC 1).
5.	Sourcing of construction materials (quarry and borrow materials)	Complied. Borrow Material (i) As per the records dt 06/07/2017, a tank in Keeraneri village located in Kilvelur (Taluk), Nagapattinam District has been identified for acquiring borrow earth. Sand Mining (i) Environmental clearance from SEIAA vide letter dated 21.06.2017 Lr. No SEIAA TN/F.No. 3223,3971/EC/1(a)/1817(A)/2014-1, the soil material is sourced from the Kollidam River, Thanjavur District at ζ Nadupadugai Village (Papanasam Taluk) ζ Koviladi Village (Boothalur Taluk)
6.	Water (Prevention and control of pollution) Act, 1974 and Air (prevention and control of pollution) Act, 1981	Complied. Batching Plant is not used by the Contractor and hence obtaining Consent to Operate is not required, instead AJAX machine (Self Loading Concrete Mixer) is used. The air quality and water quality monitoring conducted at the construction sites reveals that the construction activities do not have any significant impacts to the surroundings
7.	Noise Pollution (Regulation & Control) Rules, 2000	Complied. As per the outcome of the Environmental Monitoring conducted for Noise Quality, the observed values are less than the stipulated standard.
8.	Tamil Nadu Contract Labour (Regulation and Abolition)	Complied. As per the Act, labour license is obtained

Sl.no	Clearance/Approval Required	Compliance Status
	Rules and subsequent Amendments	
9.	Workmen's Compensation Act, 1923 and Subsequent amendments	Complied. As per the Act, labour insurance is obtained (refer Annexure - VC 2
10.	The Wildlife Protection Act, 1972, amended in 2003 and 2006	Not applicable, as there are no ecological sensitive areas located within or in the surroundings of the project site

3.6.2 Compliance status with Loan Covenant

Sl. No.	Loan Agreement Reference	Environmental Compliance Requirements	Compliance Status
1.	Schedule 5, item 4 of Loan Agreement Safeguards and Social Environment	The Borrower shall ensure, or cause the EA to ensure, that the preparation, design, construction, implementation, operation and decommissioning of the Project facilities comply with (i) all applicable laws and regulations of the Borrower and the State relating to environment, health, and safety; (ii) the Environmental Safeguards; and (iii) all measures and requirements set forth in the IEE and the EMP, and any corrective or preventative actions set forth in a Safeguards Monitoring Report.	Complied
2.	Schedule 5, item 7 of Loan Agreement Human and Financial Resources to Implement Safeguards Requirements	The Borrower shall make available, or cause the EA to make available, all necessary budgetary and human resources to fully implement the EMP, the RP and the IPP if and as required. The EA shall designate at least one expert each to supervise implementation of the EMP, and the RP.	Complied Environmental Specialist and R&R Specialist has been appointed by the PMU to supervise the implementation of the EMP and RP
3.	Schedule 5, item 8 of Loan Agreement Safeguards - Related Provisions in Bidding Documents and Works Contracts	The Borrower shall, or cause the EA to ensure, that all bidding documents and contracts for Works contain provisions that require contractors to: a) Comply with the measures and requirements relevant to the contractor set forth in the IEE, the EMP, and the RP and the IPP as applicable (to the extent they concern impacts on affected people during construction), and any corrective or preventative actions set out in a Safeguards Monitoring Report;	Complied, Environmental management plan along with the monitoring plan is enclosed in the bid document as a supplementary Information Complied, exclusive EMP budget is not available. However, the cost for

Sl. No.	Loan Agreement Reference	Environmental Compliance Requirements	Compliance Status
		<p>b) Make available a budget for all such environmental and social measures;</p> <p>c) Provide the WRD with a written notice of any unanticipated environmental, resettlement or indigenous peoples risks if any, or impacts that arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP, and the RP or the IPP if any;</p> <p>d) Adequately details the condition of roads, agricultural land and other infrastructure prior to starting to transport materials and construction; and</p> <p>e) Fully reinstate pathways, other local infrastructure, and agricultural land to at least their pre-Project condition upon the completion of construction.</p>	<p>implementing the EMP is included in the Contractor cost. For social, separate RP budget is available</p> <p>Not envisaged</p> <p>Complied, the existing landuse is studied and accordingly the construction activities are planned</p> <p>It will be addressed upon completion of construction</p>
4.	<p>Schedule 5, item 9 of Loan Agreement</p> <p>Safeguards Monitoring and Reporting</p>	<p>The Borrower shall do, or cause the EA to do, the following:</p> <p>a) Submit semi-annually Safeguards Monitoring Reports (one each for the resettlement and environment matters) to ADB and disclose relevant information from such reports to affected persons promptly upon submission;</p> <p>b) If any unanticipated environmental and/or social risks and impacts arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP, and (9d)the RP or the IPP as applicable, promptly inform ADB of the occurrence of such risks or impacts, with detailed description of the event and proposed corrective action plan;</p> <p>c) No later than award of Works contract/commencement of land acquisition and resettlement activities under the Project engage a qualified and experienced external expert or NGO under a selection process and terms of reference acceptable to ADB, to verify information produced through Project monitoring process, and facilitate the</p>	<p>Partially Complied, Semiannual report on the Resettlement is submitted. However, due to the unavailability of the Environmental expert, semi-annual report of the environment is not submitted.</p> <p>Complied, as of now there is no unanticipated environmental and/or social risks and impacts raised. If such impacts arises in future, it shall be informed to the ADB.</p> <p>Complied, qualified NGO's are engaged to verify information produced through Project monitoring process</p>

Sl. No.	Loan Agreement Reference	Environmental Compliance Requirements	Compliance Status
		<p>carrying out of any verification activities by such external expert/NGO for the Project; and</p> <p>d) Report any breach of compliance with the measures and requirements set forth in the EMP, and the RP or the IPP if any, promptly after becoming aware of the breach.</p>	Complied. Such situation does not arise
5.	<p>Schedule 5, item 10 of Loan Agreement</p> <p>Prohibited List of Investments</p>	The Borrower shall ensure, or cause the EA to ensure, that no proceeds of the loan under the Project are used to finance any activity included in the list of prohibited investment activities provided in Appendix 5 of the SPS.	Complied, provided ADB loan is spent for the CAVSCD Project
6.	<p>Schedule 5, item 11 of Loan Agreement</p> <p>Labor Standards</p>	<p>The Borrower, State, and WRD shall ensure that Works contracts under the Project follow all applicable labor laws of the Borrower and the State and that these further include provisions to the effect that contractors; (i) carry out HIV/AIDS awareness programs for labor and disseminate information at worksites on risks of sexually transmitted diseases and HIV/AIDS as part of health and safety measures for those employed during construction; and (ii) follow and implement all statutory provisions on labor (including not employing or using children as labor, equal pay for equal work), health, safety, welfare, sanitation, and working conditions. Such contracts shall also include clauses for termination in case of any breach of the stated provisions by the contractors.</p>	<p>Complied, appropriate Clauses (section 31, 32 and 33) is included under the general condition of the Contract for Labors.</p> <p>HIV/AIDS awareness programs are conducted for labors.</p> <p>Child labors are not engaged in the construction activities</p> <p>Appropriate clause for termination is included in the contract.</p>

3.6.3 Compliance with Project Environmental Management Plan (EMP)

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
Pre - Construction Stage				
Approvals and No Objection Certificate	Obtain CRZ Clearance Obtain Approval from Forest Department and Revenue Department for Felling of Trees	Complied	Satisfactory	General Conditions as stipulated in the Clearance should be adopted
Selection of Construction Camp for site office and storage of material, parking of vehicles and Workers Camp for labour to stay during non-working hours.	Since establishment of construction camp and labour camp are the decision of contractor. Selection of Construction camp and workers camp away from the habitation area, Contractor to provide safe drinking water as per IS 10500 standards for drinking water. Provide sanitation for male and female workers. Collection and disposal of solid waste of the worker's camp	Partially Complied	<ul style="list-style-type: none"> ∩ Construction camps are located away from local settlements. ∩ Since local labours are engaged the necessity for labour camp does not arise. ∩ Labours are provided with drinking water facility. ∩ Sanitation facilities lacks at site (female workers are not engaged). ∩ Solid waste management at site needs improvement 	Continuous Monitoring is required
Identification of borrow pits and quarry area	Selection of Borrow pits for earth should be away from residential area, sensitive location, and local roads. Before selection of borrow area, the contractor will take written consent from the environmental officer of PMU. Selection of sand, stone and other quarry material will be only government approved sites only	Complied	Satisfactory	Continuous Monitoring is required
Intervention with Utility	The contractor will identify water supply pipes, electrical poles, cables and access roads and bridges and prepare plans for shifting or reconstruction	Complied	Shifting of utilities are carried out by the concerned line departments.	Continuous Monitoring is required
Construction Stage				
Ambient Air Quality and Noise				
De-silting and resection of river	Dust suppression by sprinkling of water Provide dust curtain or geotextile membrane to cover soil.			

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
Transportation of construction material, borrow earth and river silts	Provide covered transportation of material and earth, Avoid haulage rout in residential area and sensitive locations	Partially Complied	Water sprinkling should be performed more frequently and construction materials including sand, cement, aggregates etc., should be covered.	Continuous Monitoring is required
Operation of construction equipment's and vehicles	Maintenance of vehicles and equipment as per manufacturers guidelines and monitor emissions of the vehicles and equipment	Not Complied	Vehicle carrying transportation materials are not covered	Continuous Monitoring is required
Quarrying and borrowing of earth for construction of embankment and road	<p>Quarrying of sand, stone and aggregates will only be from the government approved quarries.</p> <p>Operation and Rehabilitation of borrow area as per the Madras Detailed Standard Specification</p> <p>Arrangement for locating the source of supply of material for embankment and sub-grade as well as compliance to environmental requirements, as applicable shall be the sole responsibility of the contractor. WRD shall be required to inspect every borrow area location prior to approval.</p> <p>The Contractor shall not borrow earth from the selected borrow area until a formal agreement is signed between land owner and Contractor and a copy of this agreement is submitted to the concerned officer of WRD/Supervision Consultant</p> <p>Planning of haul roads for accessing borrow materials shall be undertaken during this stage. The haul roads shall be routed to avoid agricultural areas. In case agricultural land is disturbed, the</p>	Complied	<p>NoC/ Permissions from the competent authority is obtained.</p> <p>General conditions given in the lease / permission to operate the Borrow areas are followed</p> <p>All the borrow areas are identified by the Contractor and it has been inspected by the PMU officials prior to approval.</p> <p>Necessary permissions from the land owners / competent authority has been obtained</p> <p>Existing road network is being used for transportation of the borrow material to the site</p>	Continuous Monitoring is required

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
	<p>Contractor shall rehabilitate as approved by the WRD/ Supervision Consultant and pay compensation for loss of cultivation to the users as per terms and conditions of the resettlement plan.</p> <p>All borrow areas whether in private, community or govt. land shall be restored either to the original condition or as per the approved by WRD/ Supervision Consultant</p>		The work is ongoing and during the completion all the borrow area that are used for this construction works shall be restored.	
Soil Environment				
Standardisation of embankment and desilting of river and construction of road on one side embankment. Operation of borrow pits and transportation of material	<p>After cutting and filling embankment will be immediately stabilized</p> <p>Avoid de-silting within the flow of water.</p> <p>Encourage utilisation of river silt in gardening and other agricultural purpose identified in consultation with farmers.</p>	Complied	The excavated river silt is utilized for embankment strengthening.	Continuous Monitoring is required
Disposal of construction debris	Prohibition of throwing of construction debris in any sites other than the designated disposal sites identified at the detailed design stage The metallic waste will be recycled through vendors.	Partially Complied	Designated site for disposal of the construction debris is not identified.	Continuous Monitoring is required
Water Resource and Quality				
Resection and desilting of river Construction of tail-end regulators (TERs), Irrigation head sluices, drainage infalls, syphons, Bed dam, Grade dam, Chance spillage of oil, grease from heavy machineries, construction vehicles and equipment's	<p>Since the most of the construction work will take place in the lean season so mitigation measure of avoidance of desilting within the flow of water will minimise soil erosion and increase in turbidity in the downstream.</p> <p>Provide impermeable platform for storage and handling of oil and grease.</p>	Complied	Construction works shall be performed during the lean season only. However, it is evident from the site that impermeable platform for storage and handling of oil and grease is not provided	Continuous Monitoring is required
Biological Environment				

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
Clearance and grubbing of site for construction of embankment	<p>The removal of the cut trees by the forest department will be taken away by the forest department and it will be stored and later sold by the forest department according to their rules.</p> <p>The trees which are not planted by the forest department will be cut and removed by the contractor on permission of district revenue officer.</p> <p>Compensatory Plantation of 10:1 ratio meaning plantation of 10 trees in lieu of felling of 1 tree Forest Department will cut those trees which are planted by the forest department and its compensatory plantation will be done by the forest department. Other trees which are not planted by the forest department, WRD will do the compensatory plantation</p>	Complied	Trees falling in-between the River RoW are identified and compensation for the removal of trees as suggested by the Forest Department is paid. Presently, removal of trees/ cutting of Trees is under progress	Continuous Monitoring is required.
Occupation Health and Safety				
Occupational Health and Safety of labours at construction site and Labour camps	<p>Provide personal protective equipment to the labours. Ensure the labours are trained to work on the specific project. For untrained labour - training should be provided before permission to work on the site. The contractor shall provide, if required, erect and maintain necessary (temporary) living accommodation and ancillary facilities during the progress of work for labour to standards and scales approved by the PIU. Contractor shall follow all relevant provisions of the Factories Act, 1948 and</p>	Not Complied	<p>Labours are not provided with appropriate PPE. It is evident from the consultations held with the labours that they lack training.</p> <p>Temporary labour shed lacks basic amenities. It is suggested to adopt the factory and labour act provisions for the labours.</p>	<p>Continuous Monitoring is required.</p> <p>∩ Layout representing the Construction camp facilities should be immediately submitted to the PIU.</p> <p>∩ Appropriate First Aid Kit should be</p>

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
	<p>the Building & other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction & maintenance of labor camp.</p> <p>Construction camps shall not be proposed within 1000m or sufficiently away from nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community. The location, layout and basic facility provision of each labour camp shall be submitted to Engineer prior to their construction. Safety and sanitation facility should be provided in the labour camp. Uncontaminated water shall be supplied to the construction workers at labour camps. The contractor shall arrange for - a readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone,</p> <p>Availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital. Always maintain a fully equipped first aid box in the construction camp. Proper waste management system must be enforced in the camp. So that waste is not haphazardly disposed of.</p>		<p>Construction camps are located away from the settlement sites</p> <p>The layout representing the construction camp is not submitted to the PIU/PMU/PIC</p> <p>Potable water is supplied to the labours</p> <p>First aid kit is not available at site</p> <p>Health & safety is lacking at the site. It needs improvement.</p>	<p>made available at site</p> <p>Accident record should be maintained at site</p>
Community Health and Safety				
Construction activity of excavation and closure of road	Provide information about the construction schedule and construction activity Barricading construction site Display signage of diversion at	Not Complied	Inadequate signage are observed at site	Continuous Monitoring is required.

Project Activity	Mitigation Measures	Compliance	Remarks	Follow up Action Proposed
	construction road on embankment in consultation with local authority like traffic police, WRD and local community			¿ Adequate signageš should be provided at site.
Chance Findings				
Any construction activity	While excavating or dismantling any structure if any fossils, coins, articles of value / antiquity and remains of archaeological interest discovered on the site the contractor shall immediately stop work and inform the engineer from WRD. The Contractor shall take reasonable precautions to prevent his workmen or any other persons from damaging or removing any such articles. All work shall be stopped and WRD shall seek the direction of Archaeological Survey of India (ASI) before contractor recommences the work	Not applicable	Not envisaged at site	
Operation Stage				
Regular maintenance of structures and canal	Regular checks by the respective PIU staffs	-	-	-
Increased agricultural activity	Training on improved agricultural practices. Continued monitoring of water quality at sample locations	-	-	-
changed salinity in tail end areas	Improved coordination between coastal aquaculture authority and WRD to ensure shrimp farmers adhere to laws and regulations.	-	-	-

3.6.4 Environmental Monitoring of the project

a. Noise (Analysis results enclosed in the Annexure - VC 3)

Location	Value		Standards
	Day	Night	
Keelaiyur Drainage Sluice	52.4	45.1	As per the Schedule-VI ⁶ (Part - E) of Environment (Protection) Rules, 1986. The Noise limits in dB(A) fixed for the Construction equipment's (including Compactors(rollers), Front loaders, Concrete mixers, Cranes(movable), Vibrators and Saw) is 75 dB (A)
Pappanar Regulator	50.8	43.3	
Makili Drainage Sluice	51.9	41.7	
Rajan Voikkal Syphon	50.7	41.4	
The observed values are found to be less than the prescribed noise limits			

b. Ambient Air Monitoring (Analysis results enclosed in the Annexure - VC 4)

Location	Parameter	Value	Standard value
Keelaiyur Drainage Sluice	PM ₁₀ , $\mu\text{g}/\text{m}^3$	56.0	100.0
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	14.0	60.0
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	BDL	80.0
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	12.0	80.0
	Carbon monoxide, mg/m^3	BDL	4.0
Pappanar Regulator	PM ₁₀ , $\mu\text{g}/\text{m}^3$	59.0	
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	17.0	
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	BDL	
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	13.0	
	Carbon monoxide, mg/m^3	BDL	
Makili Drainage Sluice	PM ₁₀ , $\mu\text{g}/\text{m}^3$	61.0	
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	20.0	
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	BDL	
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	17.0	
	Carbon monoxide, mg/m^3	BDL	
Rajan Voikkal Syphon	PM ₁₀ , $\mu\text{g}/\text{m}^3$	61.0	
	PM _{2.5} , $\mu\text{g}/\text{m}^3$	19.0	
	Oxides of Sulphur, $\mu\text{g}/\text{m}^3$	8.2	
	Oxides of Nitrogen, $\mu\text{g}/\text{m}^3$	16.0	
	Carbon monoxide, mg/m^3	BDL	
The observed AAQ values are within the regulatory standards indicating the construction activities, does not have any impact on the existing air quality.			

c. Water Quality Monitoring (Analysis results enclosed in the Annexures - VC 5 and VC 6)

¿ Groundwater Quality

Sl.no	Parameter	Values				BIS Standard (IS 10500 :1991)
		Keelaiyur Drainage Sluice	Pappanar Regulator	Makili Drainage Sluice	Rajan Voikkal Syphon	
1	pH at 25°C	7.08	7.20	6.99	7.29	6.5 to 8.5
2	Temperature °C	26.0	26.1	26.2	26	-

Sl.no	Parameter	Values				BIS Standard (IS 10500 :1991)
		Keelaiyur Drainage Sluice	Pappanar Regulator	Makili Drainage Sluice	Rajan Voikkal Syphon	
3	Electrical Conductivity μ mhos	28461	16478	16057	16860	-
4	Turbidity NTU	1.6	1.3	1.8	1.7	5
5	Total Dissolved Solids mg/l	16899	9564	9456	9561	2000
6	Total Suspended Solids mg/l	15.6	10	8.6	9	-
7	Dissolved Oxygen mg/l	5.9	6.3	5.6	6.0	-
8	Chemical Oxygen Demand mg/l	48	26	36	24	-
9	Biochemical Oxygen Demand mg/l	8.2	4.2	5.2	4.0	-
10	Fecal Coliform Nos/100ml	33	17	14	22	-

The observations from the groundwater quality analysis are

- The water quality remains in alkaline range (7 to 8 pH)
- Turbidity is observed to be less than the prescribed limits
- The total dissolved solids (TDS) in all the water samples are very high than the stipulated standard limits indicating the strong influence of the sea water intrusion and the groundwater is not fit for drinking purposes
- The presence of Fecal Coliforms in all the samples indicates that the groundwater is contaminated by sewage leakage/ infiltration.

ζ Surface Water Quality

Sl.no	Parameter	Values				Standard IS: 2296
		Keelaiyur Drainage Sluice	Pappanar Regulator	Makili Drainage Sluice	Rajan Voikkal Syphon	
1	pH at 25°C	7.48	7.98	7.15	7.46	6.5 to 8.5
2	Temperature °C	26.0	26.0	26.0	26.1	-
3	Electrical Conductivity μ mhos	45863	56564	45627	61587	2500
4	Turbidity NTU	9.8	32.6	21	47	-
5	Total Dissolved Solids mg/l	26456	33456	26478	36458	2100
6	Total Suspended Solids mg/l	42.7	68	45	72	-
7	Dissolved Oxygen mg/l	5.6	5.6	5.9	5.2	6
8	Chemical Oxygen Demand mg/l	496	548	397	610	-
9	Biochemical Oxygen Demand mg/l	42	62	36	76	2
10	Fecal Coliform Nos/100ml	<2	<2	<2	<2	50

The observations from the surface water quality analysis are

- The water quality remains alkaline for all sampling locations

Sl.no	Parameter	Values				Standard IS: 2296
		Keelaiyur Drainage Sluice	Pappanar Regulator	Makili Drainage Sluice	Rajan Voikkal Syphon	
ii.	The recorded Electrical Conductivity is very high than the stipulated standard indicating the presence of salinity					
iii.	The recorded TDS is very high than the stipulated standard limit of 2000mg/l, indicating the presence of salinity due to the sea water intrusion.					
iv.	The DO concentration is within the standard limits, indicating a healthier environment for aquatic ecosystem. However, high BOD concentration indicates the surface water is contaminated by the organic pollution.					

3.6.5 Environmental Grievance Record and Action Taken

Date	Project	Problem related to	Received through	Description	Status
	Package No. CW 6: Infrastructure Improvements and Reconstruction Works on Vedaranyam Canal and Uppanar	None	NA	NA	No Grievances have been recorded so far.

3.7 Package No. CAVSCD/TN/PS (Design Supply, Installation, Testing and commissioning of various pumping machineries including associated Electrical, Mechanical and Civil Works

7. All the construction works related to this package (installation of 13 Pump Stations) is completed and it is in the operational stage. There is no record available with respect to the implementation of the Environmental Safeguard measures. During the site visits, one of the pumping station located in Pamani to Umbalacheri Road is visited and it is observed that the restoration of the construction site is not fully completed. Since this package is under the DLP (Defect Liability Period), it is suggested that the contractor should restore the site as earlier as possible.

8. The IEE prepared for the CAVSCDP does not highlight the Environmental Safeguard measures to be adopted during the construction and operation of the pump stations. Hence it is suggested to include a Standard Operating Guideline (SOG) during pump operation as an amendment in the contractor agreement during the DLP. A sample SOG is enclosed in the Annexure - PS 1.

	
<p>View of the Pump Station</p>	<p>Blue metal used for the construction is not removed from the site</p>
	
<p>Presence of Blue metal in the other side of the Pump Station</p>	<p>Periodic Cleaning is not done</p>



Periodic Cleaning is not done



Construction is not properly completed. The steel rods are not completely removed

4 Compliance to the ADB Aide Memoire

9. A compliance matrix has been prepared to address the findings indicated with respect to the Environmental Safeguard in the ADB Aide Memoire identified during the Loan Review Mission 16th to 24th of April, 2018.

Sl.no	ADB Observations	Response from PMU
1.	<p><u>Environmental Monitoring and Reporting:</u> Submission of Annual Environmental Monitoring Report by 15 June 2018 covering Environmental safeguard activities between June 2017 to May 2018.</p> <p>The mission requested to include Resettlement Construction Environmental Monitoring Reports</p>	<p>Complied, as suggested Annual Environmental Monitoring Report has been prepared covering the Environmental safeguard activities that occurred between June 2017 and May 2018. However, there is a delay in the submission of the report due to the delayed recruitment of the new Environmental Specialist.</p> <p>As suggested a section on the Resettlement Construction Environmental Monitoring Report is included</p>
2.	<p><u>Status of Implementation of Environment Safeguards at the Work Site:</u> To include EMP as an addendum to the existing Contractors contract (Resettlement Construction Sites) by 17 May 2018 and to monitor the EMP implementation</p>	<p>Complied, as suggested EMP has been circulated to the concerned PWD (Buildings) authorities to include it as an addendum to the existing Contractor's Contract and it is also instructed that the concern PWD (Buildings) authorities will monitor the EMP implementation.</p>
3.	<p><u>Health and Safety Aspects:</u> Compliance with Occupational Health and Safety Standards is not evident at Pinnavasal Construction Site. Basic amenities for the labours are not provided</p>	<p>Complied, the observations made by the ADB mission members has been shared with the Concern PWD (Buildings) authorities and appropriate action has been taken. Looking at the progress of the works, it is nearing completion and accordingly there was a drastic reduction in the workman force. Now most of the labours are temporarily accommodated in the constructed buildings and sufficient toilet facilities (provided with Septic tank) has been provided. Potable water supply also been provided. Adequate light facilities are provided in the labour camp. It is suggested to provide health checkup to the labours.</p>
4.	<p><u>HIV / AIDS awareness Program:</u> To conduct HIV/AIDS awareness program at Resettlements Sites</p>	<p>Complied, HIV awareness program has been conducted for the resettlement sites and it shall be followed during the work season</p>

5.	<u>Core Labor Standards:</u> ¿ Women are being paid less than man for equal works ¿ Migrants workers are not paid for three months ¿ The mission discussed these concerns with the contractor and agreed on the following actions <ul style="list-style-type: none"> o Review and compile a report on workers payment to identify the pay gaps o Rectify identified wage gaps o Submit records of corrective actions to PMU and ADB by 30 April 2018 	Partially Complied, It is informed by the Contractor that <ul style="list-style-type: none"> ¿ Equal wages has been paid ¿ Salary overdue has been paid to the migrant workers ¿ Wage register is maintained at site, it shall be compiled to identify the pay gaps ¿ Equal wages has been followed ¿ The requested corrective action record is not submitted. It shall be assured that the record will be submitted by end of August 2018 However, appropriate records for the same shall be verified for confirmation
6.	<u>Contractor Insurance:</u> Submission of labour Insurance by Pandavaiyar and Valavanar Contractors by 15 May 2018	Complied Both the Contractor have submitted the labour insurance and it is annexed (Refer Annexure PR 5 and Annexure VD 4)

5 EMP Compliance Monitoring in Resettlement sites

10. As per the Aide memoire (Loan Review Mission 16th to 24th of April, 2018), environmental monitoring (including EMP implementation) has to be conducted for the resettlement sites. In view of that all the resettlement sites have been visited and observations are shared with the Contractors and the PIU for improvement.

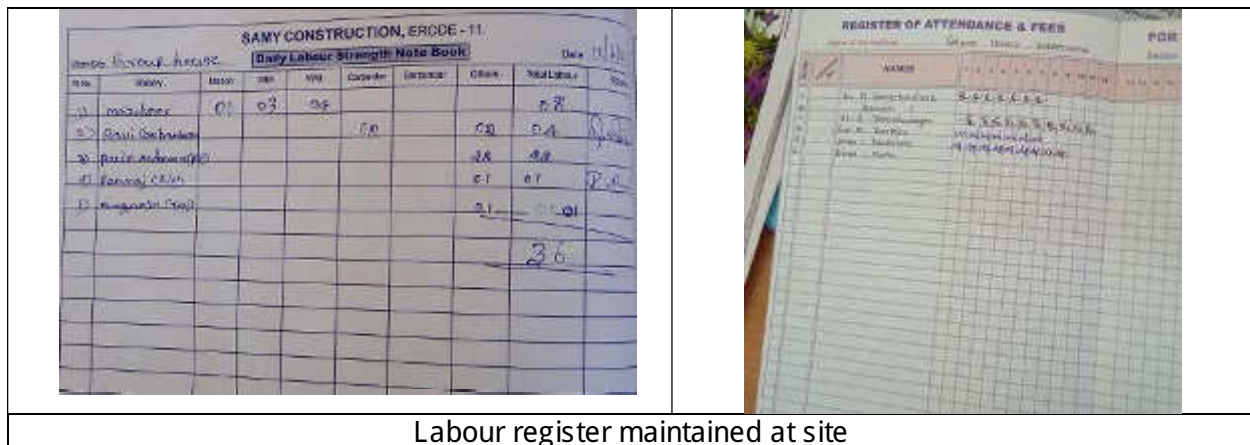
- i. Kankuduthavanitham Village (Pandavaiyar River, Resettlement Site): This resettlement site will have 4 blocks comprising of 16 houses. The physical progress of the construction works is about 30%. Being a small construction site, very less labours (less than 10) are employed. The non-compliances with respect to the EMP is as follows
 - ¿ First aid kit is not available at site
 - ¿ Inadequate housekeeping
 - ¿ Labour register is not maintained at site
 - ¿ Disposal of removed wild vegetation from the site
 - ¿ Workers observed without PPE's
 - ¿ Site barricading is required
 - ¿ Safety Signages should be provided
 - ¿ Toilet facilities (either mobile toilets or temporary toilets with septic tank facility)



Kankodutha Vanigam (Resettlement site) site inspection by the PMU

ii. Kadandethi Village (Harichandranadhi River, Resettlement Site): This resettlement site is planned to have 190 houses. As per the site condition, ground clearance and piling works were in progress. Overall physical progress of the work would be less than 20%. It is observed that the Contractor is maintaining the labour register. The labour camp is observed with basic amenities including supply of potable water, resting provisions and Construction materials are stocked in designated areas. The non-compliances with respect to the EMP is as follows

- ¿ First aid kit is not available at site
- ¿ Workers observed without PPE š
- ¿ Site barricading is required
- ¿ Safety Signage š should be provided
- ¿ Inadequate housekeeping
- ¿ Toilet facilities (either mobile toilets or temporary toilets with septic tank facility)
- ¿ Sprinkling of water to arrest dust pollution
- ¿ Kitchen facility with LPG provision should be provided



Labour register maintained at site



Labour camp at site



Construction materials are stored properly

iii. Pinnavasal Village (Vellaiyar River, Resettlement Site): This resettlement site is planned to have 14 Blocks. The physical progress of the construction works is about 70%. Labour camp is provided with potable water, adequate light facility and toilet facilities (with Septic Tank provision). First aid kit is available at site with all essential medicines. Labour register is maintained. However, the construction site lacks the following EMP measures

- ¿ Workers observed without PPE
- ¿ Site barricading is not provided
- ¿ Absence of Safety Signage
- ¿ Inadequate housekeeping
- ¿ Kitchen facility with LPG provision should be provided
- ¿ Inadequate Solid Waste management practice



Site Inspection by PMU



Septic Tank is provided



Potable water supply for Labours



Labour register for migrant workers

- iv. Thittanimuttam Village - Pandavaiyar River Resettlement Site): Construction works in this resettlement site was started recently, the physical progress of the construction works would be less than 5%. At the time of inspection ground clearing was started and construction materials are transported to the site. There is no labour camp at site, it is informed by the contractor that local labours would be engaged in the construction works. The contractor has been instructed to follow the EMP during the construction works.



11. As requested by the ADB, EMP has been circulated to the PWD (Buildings) for implementation. A sample of the EMP implementation status submitted for the Kankuduthavanitham Resettlement site is enclosed in the Annexure RP 1. The submitted EMP shall be verified in the site and the observations shall be shared with the Contractor through the PMW (Buildings) and the subsequent monitoring shall be recorded in the Biannual Environmental Monitoring Report.

6 Follow-up Action and Conclusion

12. There are four key sections in the Environmental Monitoring Report for which the Implementing Agency/ Executing Agency and the Contractors should comply viz, (i) Regulatory Compliances, (ii) Loan Covenant Compliances (iii) Environmental Management Plan (EMP) Compliance and Environmental Quality Monitoring Compliance

- (i) Regulatory Compliances: Based on the information provided in the Annual Environmental Monitoring Report, almost all the Contractors are in compliance to the Regulatory Requirements. All the necessary clearances and permissions are obtained. However, the maintenance of documents is not well organized, this is noted among all the Contractors. The missing documents/ correspondences/ communication evidences (if any) that are not submitted to the PIU/ PMU shall be listed and will be circulated to the PIU and Contractors for submission of the same at the earliest, the status of the same shall be updated in the Quarterly / Biannual Environmental Monitoring Reports
- (ii) Loan Covenant Compliances: All the terms and conditions (with respect to the Environmental Compliance Requirements) referred in the Loan Covenant are in compliance with the project activities.
- (iii) Environmental Management Plan Compliances: The suggested mitigation/ management measures in the EMP has been complied for most of the project activities. However, some of the Non Compliance are also recorded with respect to the sanitation

facilities at site, Solid waste Management, Labour safety and suppression of dust at site. The identified Non Compliances shall be listed and will be circulated to the concern PIU's and Contractors to take appropriate action. The status of the same shall be updated in the Quarterly / Biannual Environmental Monitoring Reports.

(iv) Environmental Quality Monitoring Compliances: The key environs viz, air quality, water quality (surface and groundwater), noise quality has been monitored for all packages and the analysis results are shared in the Annual Environmental Monitoring Report. From the analysis outcome, it is evident that the construction activities does not have any impacts on the surrounding environment. However, it is observed that the Environmental Quality Monitoring is not in compliance with the frequency as suggested in the Environmental Monitoring Plan. Hence appropriate communication shall be circulated to the concerned PIU's and Contractor to increase the frequency of the quality monitoring at site as per the suggested monitoring plan. The status of the same shall be updated in the Biannual/ Annual Environmental Monitoring Reports.

(v) Activities to be Performed

- ¿ Conducting Environmental Health and Safety Workshops for all packages (including the Resettlement Sites)
- ¿ Upgrading the Environmental Monitoring Formats to capture the mitigation measures as suggested in the EMP
- ¿ To conduct Labour Health Checkup camps more frequently
- ¿ It shall be made sure that the Contractors abide by the Factories Act and Labour Act provisions for labour camps and construction camps
- ¿ It will be suggested to all the PIU's and Contractors that the water quality analysis should be carried out as follows
 - o Groundwater Quality parameters should be in-line with the IS 10500: 2012 (Drinking Water Standards) and
 - o Surface water quality parameters should be in-line with IS: 2296 (Surface Water Quality Standards).
- ¿ Preparation and submission of Biannual Environmental Monitoring Report (BEMR)/ Annual Environmental Monitoring Report
- ¿ Assisting PIU and Contractors in implementing the EMP